TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

No. 203.

THE CITY OF ELIZABETH, GEORGE W. TUBBS, AND THE NEW JERSEY WOOD PAVING COMPANY, APPELLANTS,

vs.

THE AMERICAN NICOLSON PAVEMENT COMPANY.

EXHIBITS ACCOMPANYING TRANSCRIPT.

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EXHIBITS ACCOMPANYING TRANSCRIPT.

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1 *Complainant's Exhibit No.* 1.

Contract for paving North avenue, from the easterly line of Jefferson avenue to Broad street, with the Brocklebank and Trainer's patent wood pavement.

Articles of agreement, made the twelfth day of July, A. D. 1870, between New Jersey Wood Paving Company, of the city of Elizabeth, in the county of Union, and State of New Jersey, of the first part, and the City of Elizabeth, of the second part, witnesseth:

That the said party of the first part, for and in consideration of the payments to be made, as hereinafter mentioned, by the party of the second part, hereby covenant and agree to and with the said party of the second part to pave North avenue, from the easterly line of Jefferson avenue to Broad street, with the Brocklebank & Trainer's patent wood pavement, in accordance with the specifications of said work, signed by the said party of the first part, and hereunto an-
2 nexed and making part of this contract, and in accordance with the ordinance of the city of Elizabeth, for the following prices, that is to say, four dollars and fifty cents per sq. yard for Brocklebank and Trainer's patent wood pavement, fifty cents per lineal foot for new curb, six cents per lineal foot for resetting curb; all complete, as mentioned and specified in a proposal for said work, dated July 12th A. D. 1870, upon which the said work was awarded to the said party of the first part.

The work is be done in a workman-like manner, the party of the *the* first part hereby agreeing strictly to observe the requirements of section 23, 24, 25, and 29, of article 1, of an ordinance of said city entitled "An ordinance relating to streets and highways, the construction and repair of sidewalks and the public grounds of the city, approved April 15, 1868," under the penalties therein mentioned, and the whole to be completed to the satisfaction and approval of the street commis-
3 sioner of said city, or such person as the city council may appoint to inspect the said work, within the time specified in said proposal, unless the said time shall be extended by the city council, and then within the time so extended; and in case the said party of the first part fails so to complete said work, then the said party of the first part agrees to and with the said party of the second part to pay to the said party of the second part, or their successors, as liquidated, damages therefor, sixty-two dollars per day for each day's neglect to complete said work according to this contract beyond the time so fixed for said completion; and also the sum of three dollars and fifty cents for each day that the aggregate time of all the inspectors employed on said work shall exceed sixty days.

And the party of the second part agrees to and with the party of the first part to pay to the party of the first part the sum of three
4 dollars and fifty cents for each *for each* day that the aggregate time of all the inspectors employed on said work shall be less than sixty days.

All penalties incurred by the said contractor and expenses for the removal of improper materials and other expenses on said work incurred by city officers to be deducted by the street commissioners from the final estimate of the amount due to the contractor on this contract before the same is presented to the city council, and to be allowed accordingly.

The street commissioners shall, upon the refusal or neglect of the said

party of the first part to comply with this agreement, be privileged to cause the said work to be done, and the said party of the first part in such case to receive no benefit from this contract, but to be liable for all deficiences besides said penalties. The street commissioner, upon the refusal or neglect of the said contractor to remove improper materials, on being directed so to do by the street commissioner or person
5 appointed to inspect the said work, as aforesaid, to be privileged to cause the same to be removed at the expense of the said contractor, to be deducted as hereinbefore mentioned.

And the said party of the second part hereby promises and agrees to and with the said party of the first part, to pay to the said party of the first part, his heirs and assigns, for doing and completing the said work in the manner, and according to the terms and conditions of this agreement, the same having first been approved of by the street commissioner in writing, the prices aforesaid, in manner following, that is to say, seventy-five per centum of the same in payments during the progress of said work, (the amount of such payments to be determined by the city surveyor and street commissioner) and the balance (twenty-five per centum thereof) to be paid when said work shall have been fully completed and accepted by the said commissioner; said
6 payments to be made in cash.

To prevent all disputes, it is hereby agreed that the city surveyor and street commissioner shall in all cases, determine the amount or quantity of the several kinds of work which are to be paid for under this contract, and the amount of compensation at contract prices to be paid therefor. And also the said city surveyor shall in all cases decide every question which may arise relating to the measurement of any work done under this contract, and his estimate and decision shall be final and conclusive.

In witness whereof the said New Jersey Wood Paving Company, party to the first part, have hereunto set their hands and seals; and the said the city of Elizabeth has caused its common seal to be affixed hereunto, and the same to be signed by the mayor on the day and year first above written.

7 GEO. W. TUBBS, *Pres't.* [L. S.]
PH. H. GREIR, *Mayor.* [L. L.]

Signed, sealed, and delivered in the presence of—
J. SEEPLE.

Specifications for laying Brocklebank and Trainer pavement.

All paving stones and other materials shall be taken up and removed from the line of the street; the subsoil and other matter is then to be excavated and removed of the full width of the proposed pavement to a depth of nine inches below the top of the proposed new pavement. Care must be taken in excavating to preserve the proper crown. Upon this earth foundation is to be placed a layer of sand or gravel to a depth necessary to bring the top of the proposed new pavement to a proper grade, and so as to give an easy and smooth crown to the
8 street. On this foundation the Brocklebank and Trainer pavement is to be layed.

A compound flooring is first formed, consisting of an under or ground layer of sound fine boards, one inch thick, laid lengthwise with the line of the street, and are to be thoroughly *to be* coated on both sides with a mixture of coal-tar and pitch, the ends *the* resting on similar

boards placed transversely from curb to curb; on this layer of boards are to be placed on upper layer of transverse planking or beveled joist one inch thick one and three-quarters (1¾) inches wide on the top, and beveled down so as to give one and one-fourth (1¼) inches on the bottom; upon the foundation thus laid will be placed the pavement, which shall consist of white pine blocks free from rot or sap, having a thickness uniformly of three inches a length of six (6) inches and a width of not less than six (6) inches, having a dovetail rebate cut in the lower face
9 of the blocks on both sides three-eighths (⅜) of an inch at the top and beveled down to one-eighth of an inch at the bottom so as to receive the transverse planking. The blocks for paving the gutter are to be sawed to a uniform bevel, so that the channel for surface water will be formed about six inches outside of the curb line.

The blocks before being set are to be dipped in a mixture of coal-tar and pitch and then to be set on end in a line at right angles with the street, except at intersections. Care must be taken that the joints be broken, and also that all rot or sap be trimmed off. The spaces between each rows of blocks are to be filled with clean gravel and a mixture of coal-tar and pitch, thoroughly mixed and compactly rammed by means of paviors' rammers and an iron blade prepared to fit the joists, which blade, during the progress of ramming, shall not be moved more than nine inches between the blows.

10 After the blocks have been thus set and thoroughly rammed between the rows the entire surface of the roadway shall be slushed with a heated composition of coal-tar and pitch and immediately covered with sound gravel and clean sand in equal proportions to a depth of three-quarters of an inch.

Old materials.—All old materials, such as gutter-stones and cobble-stones, which it becomes necessary to remove, may be taken up and removed by the respective owners thereof, provided such removal is made in advance of the work of grading the street. If said stones are not taken up and removed by the owners within three days after being notified by the inspector, they shall be considered as the property of the contractor, and the same shall be immediately removed by him from the line of the work. A free, clear, and sufficient passage shall be left upon the side-walk at all times after the same has been graded.

11 *Clearing up.*—As the street is graded and paved, the side-walk graded, and the work completed, the contractor shall remove all refuse stones, boulders, stumps, rubbish, or other materials from the street, and leave all roads and places free, clear, and in good order, and until this is done and a certificate of the street commissioner of the effect that all surplus materials have been removed from the line of the work the same will not be considered as completed.

The work to be commenced by such time as may be designated by the street commissioner, and to be finished within the number of days bid for by the contractor; the contractor giving the street commissioner at least two days' notice before breaking ground.

Curb to be set, or reset, on each side of the street, to the established grad', and all stones furnished shall not be less than 3 feet long,
12 inches thick, and 16 inches wide throughout, to be of the best quality North River blue stone, and to be cut, prepared, and laid in the following manner, that is to say: the top of the stone shall be cut to a level of 1 inch, the front part to be cut smooth and to a fair line the whole depth of the gutter; the ends, from top to bottom, to be truly squared so as to form close and even joints, the front so laid as to present a fair and unbroken line; 8 inches of the curb shall be laid above the kennel,

and not less than 8 inches below it. All curb, set or reset, to be filled and to be backed up with at least 6 inches of sand. Corners to be turned to the line in all intersecting streets where necessary. The present curb to be used in all cases when the same is unbroken.

All materials furnished and all the work to be done, which do not strictly conform to this specification or to the city ordinance,
13 shall be removed forthwith, and other materials and work done that shall be in accordance therewith; and in case of the neglect or refusal of the contractor, or those employed by him, to remove such materials, the street commissioner shall cause the same to be removed at the expense of the contractor and to deduct the cost of such removal and all other expenses thereon from the amount of the contract.

The right to construct any sewer or sewers, or receiving-basins and culverts in said street, and to grant permits for house-connections therewith at any time previous to the grading of the street for the laying of the pavement over the line of the same, is expressly reserved to the city council, and said contractor shall not interfere with, or place any impediment in the way of any person or persons who may be engaged in the construction of such sewer, or in making any con-
14 nection therewith, or in setting or resetting any curb or gutter-stones on the line of the street under the direction of the street commissioner, or otherwise.

The contractor will be required to re-adjust the manhole-heads over the line of the sewer, to conform to the level of the pavement, before the pavement is laid down, at such price as may be agreed upon with the engineer; he shall also provide for the flow of all drains or water-courses interrupted during the progress of the work, at his own expense. All loss or *drainage* arising out of the nature of the work to be executed, from accidents or from the action of the elements, or the injury or breaking of gas or water pipes, to be sustained by the contractor.

Inspector.—An inspector will be placed upon the work and retained at the pleasure of the city council, until the same is fully completed; and should the work be prosecuted from more than one place at the same time, an inspector will be placed at each point to supervise the same; it being understood that the time bid in the proposals
15 refers to the aggregate time of all the inspectors who may be appointed on the work, and not to single consecutive days; it being further understood that the contractor shall be entitled to receive the sum of three dollars and fifty cents per day for each and every day that the aggregate time of all the inspectors employed upon said work may exceed the time stipulated in the bid for its completion.

Bidders will state the price per lineal foot for furnishing and setting curb, the price per square yard for the Brocklebank & Trainer pavement, and the price per square foot for furnishing and laying bridge-stone; also the time taken for the completion of the work, which will be tested at the rate of $3.50 per day. These prices are to cover the expenses of regulating the curb on the whole line of the work, the expense of excavation or filling, also the furnishing of all the necessary materials and labor for the completion of all the work. Double prices will be allowed for corners that are bids for curb.

16 Bids containing more than is required to be bid for will be rejected as informal.

No certificate for payment will be given for a portion of the work done, which is not accompanied by the inspector's certificate.

The contractor shall be liable for keeping in good repair the whole of

the work executed by him for a period of twelve months from the date of completion.

The quantities are those that have been estimated approximately for the work. The city council do not hold themselves responsible for the same, and bidders are required to examine the plans and ground, and judge for themselves. Any omissions, alterations, or additions made by direction of the city authorities to the work during its progress are in no way to vitiate the contract, but the amount and value to be satisfactorily agreed upon in writing with the street commissioner or engineer, before such work is done, otherwise no extra bills will be allowed. All extra bills must be presented and approved before the final estimate is given.

17 In case of any alterations, detention, or suspension of the work, caused by the neglect or by the order of any officer of the corporation after the contract has been duly awarded, thereby causing a real or supposed loss to the contractor, the same must be reported to the city council at the first council meeting after date of such alteration, detention, or suspension, otherwise no allowance will be made therefor.

City surveyor's and inspector's certificates of work done must be presented at the street commissioner's office three days previous to the regular meeting of the city council. No certificate will be given for any one portion of the street unfinished.

L. H. HIGGINS,
Street Commissioner, Elizabeth.
GEO. W. TUBBS,
Pres't.

18 Awarded to the New Jersey Wood-Paving Company, July 12, 1870.

Proposals *for* made this twelfth day of July, 1870, by the New Jersey Wood-Paving Company for paving North avenue from the easterly line of Jefferson avenue to Broad street with the Bocklebank & Trainer patent wood pavement.

1. I do declare that the New Jersey Wood-Paving Company are the only persons interested in this proposal, and that no other person than herein named has any interest in this proposal, or in the contract proposed to be taken.

2. I further declare that this proposal is made without any connection with any other person or persons making a proposal for the same work, and is in all respects fair and without collusion or fraud.

3. I refere to the estimate and specifications forming a part of this proposal issued by the street commissioner for proposals in relation to this contract, dated Jan. 18, 1870, and I will contract to furnish all the necessary material and labor, and perform the above-named work
19 in the manner and the conditions required by the specification above referred to, and upon the annexed terms, to wit:

	Amount.
For 13,700 yards Brocklebank & Trainer patent wood pavement, @ 4.50 p'r sq. yard	61,650
100 lineal feet of new curb	50
100 lineal feet of curb to be reset 6	6
60 days' inspection, @ 3.50 per day	210
	61,916

We will further contract to commence the said work when directed, and finish the same by or before the expiration of the time bid for, unless said work is suspended by order of the city council, and to authorize the said council to deduct from the moneys which may grow due to us under the contract for the above work the sum specified in section 33 of an ordinance relating to streets and highways, the construction and repair of sidewalks and the public grounds of the city, passed
20 April 27, 1863, for each and every day the same may be uncompleted after the time above stipulated shall have expired.

[L. S.] GEO. W. TUBBS,
President New Jersey Wood-Paving Co.

CITY OF ELIZABETH,
Union County, ss:

I, Geo. W. Tubbs, being duly sworn, say that the several matters stated in the annexed proposal are in all respects true.

GEO. W. TUBBS.

Sworn and subscribed to this twelfth day of July, 1870, before me.
SAMUEL S. MOORE,
Notary Public.

21 Know all now by these presents, that we, the New Jersey Wood-Paving Co., William W. Crane and Andrew Dutcher, are indebted to the city of Elizabeth in the sum of twenty-five thousand dollars lawful money of the United States, to be paid to the said The City of Elizabeth, its successors and assigns, to which payment well and truly to be made we bind ourselves, our and each of our heirs, executors, and administrators, jointly and severally, by these presents, sealed with our seals, and dated this twelfth day of July, eighteen hundred and seventy.

Whereas the said The New Jersey Wood-Paving Company has sent into the city council of the city of Elizabeth a proposal to pave North avenue, from the easterly line of Jefferson avenue to Broad street, for about the sum of sixty-two thousand dollars, in accordance with the ordinance of said city:

Now, the condition of this obligation is such that if the said The New Jersey Wood-Paving Company, on being awarded the said work,
22 shall enter into a contract for the faithful performance of the same according to the plans and specifications of said work, and shall perform the same in good and workmanlike manner according to the terms of the said contract and specification, and satisfactorily to the city council, or such person or persons as they appoint, or upon the failure or neglect of the said The New Jersey Wood-Paving Company to enter into and execute said contract, if the said William W. Crane and Andrew Dutcher, their heirs, executors, or administrators, or either of them, shall and do well and truly pay to the said The City of Elizabeth, such sums of money as the said The City of Elizabeth shall pay to any person or persons, by whom the said work may be done, over and above the amount that the said The New Jersey Wood-Paving Company would have been entitled to receive upon the completion thereof, under and according to the terms of said proposal, then this obligation to be void; else to be and remain in full force and virtue.

23 GEO. W. TUBBS, *Pres'd't.*
W'M W. CRANE.
ANDREW DUTCHER.

Sealed and delivered in the presence of—
[L. S.] S. S. MOORE.

I do hereby certify the foregoing to be a true copy of the original exhibit in said cause on file in this office.

Witness my hand and official seal at Trenton this sixteenth day of October, A. D. 1875.

[SEAL.] S. D. OLPHANT, *Clerk.*

24 *Complainant's Exhibit No. 2.*

Contract for paving Garden street from Maple avenue to Washington avenue with wooden pavement.

Articles of agreement made the 18th day of February, A. D. 1870, between George W. Tubbs, of the city of Elizabeth, in the county of Union, and State of New Jersey, of the first part, and the city of Elizabeth of the second part, witnesseth:

That the said party of the first part, for and in consideration of the payments to be made as hereinafter mentioned by the party of the second part, hereby covenant and agree to and with the said party of the second part, to pave Garden street from Maple avenue to Washington avenue with wooden pavement, where the same has not already been done in accordance with the specifications of said work, signed by the said party of the first part, and hereunto annexed and making part of this contract, and in accordance with the ordinance of the city of Elizabeth, for the following prices, that is to say: four dollars and fifty cents per square yard for pavement laid complete according to the specification, as mentioned and specified in a proposal for said work,
25 dated October 20th, A. D. 1869, upon which the said work was awarded to the said party of the first part.

The work to be done in a workmanlike manner, the party of the first part hereby agreeing strictly to observe the requirements of sections 23, 24, 25, and 29 of article 1, of an ordinance of said city, entitled "An ordinance relating to streets and highways, the construction and repair of sidewalks and the public grounds of the city, approved April 15th, 1868," under the penalties therein mentioned, and the whole to be completed to the satisfaction and approval of the street commissioner of said city, or such person as the city council may appoint to inspect the said work, within the time specified in said proposal, unless the said time shall be extended by the city council, and then within the time so extended.

And in case the said party of the first part fails to complete said work, then the said party of the first part agrees to and with the said party of the second part to pay to the said party of the second part, or their successors, as liquidated damages therefor, twenty-seven dollars per day for each day's neglect to complete said work according to this contract beyond the time so fixed for said completion; and also the sum
26 of two dollars and twenty-five cents for each day that the aggregate time of all the inspectors employed on said work shall exceed thirty-five days.

And the party of the second part agrees to and with the party of the first part to pay to the party of the first part the sum of two dollars and twenty-five cents for each day the aggregate time of all the inspectors employed on said work shall be less than thirty-five days.

All penalties incurred by the said contractor, and expenses for the removal of improper materials and other expenses on said work incurred by city officers, to be deducted by the street commissioner from the final estimate of the amount due to the contractor on his contract before the same is presented to the city council and to be allowed accordingly.

The street commissioner shall, upon the refusal or neglect of the said party of the first part to comply with this agreement, be privileged to cause the said work to be done, and the said party of the first part in such case to receive no benefit from this contract, but to be liable for all deficiencies beside said penalties. The street commissioner , upon the refusal or neglect of the contractor to remove improper materials *or* being directed so to do by the street commissioner or person ap-
27 pointed to inspect the said work as aforesaid, be privileged to cause the same to be removed at the expense of the said contractor, to be deducted as hereinbefore mentioned.

And the said party of the second part hereby promise' and agrees to and with the said party of the first part, to pay to the said party of the first part, his heirs and assigns, for doing and completing the said work in the manner and according to the terms and conditions of this agreement, the same having first been approved by the street commissioner, in writing, the prices aforesaid, in manner following, that is to say: Seventy-five per centum of the same in payments during the progress of said work (the amount of such payments to be determined by the city surveyor and street commissioner), and the balance (twenty-five per centum thereof) to be paid when said work shall have been fully completed and accepted by the said commissioner; said payments to be made in cash.

To prevent all disputes it is hereby agreed that *that* the city surveyor and street commissioner shall in all cases determine the amount or quantity of the several kinds of work which are to be paid for under this contract, and the amount of compensation at contract-prices to be paid therefor.

28 And also the said city surveyor shall in all cases decide every question which may arise relating to the measurement of any work done under this contract, and his estimate and decision shall be final and conclusive.

In witness whereof the said George W. Tubbs, party of the first part, has hereunto set his seal, and the said the city of Elizabeth has caused its common seal to be affixed hereunto, and the same to be signed by the mayor on the day and year first above written.

GEO. W. TUBBS. [L. S.]
PH. H. GRIER, *Mayor.* [L. S.]

Signed, sealed, and delivered in the presence of—
J. SEIPLE.

29 Specifications of Brocklebank and Trainor pavement for paving Garden street from Maple avenue to Washington avenue with wood.

Preparation of road-bed, etc.—From the line of work shall be removed all paving and other stones. The earth will then be removed to the depth of nine inches below the top line of the contemplated improvement or pavement when completed. All inequalities to be brought to a proper grade. Upon the earth foundation is to be placed a layer of sand or gravel to a depth necessary to bring the top of the pavement to a proper grade and so as to give an easy and smooth crown to the street. On this foundation the Brocklebank and Trainor pavement is to be laid. A compound flooring is first formed, consisting of an underground layer of sound pine boards one inch thick laid lengthwise with the line of the street, and all to be thoroughly tarred on both sides with hot coal-tar and pitch, the ends resting on similar boards placed transversely

from curb to curb. On this layer of boards are to be placed and upper layer of tra'verse planking or leveled joist one inch thick, one and three-fourth inches wide on top, and leveled down so as to give one
30 and one-fourth inches on the bottom. Wooden blocks cut so as to be three (3) inches thick, six (6) inches long, having a dove-tailed rebate cut on the lower face of the blocks on both sides ($\frac{3}{8}$) three-eighths of an inch deep at the top, and leveled down to one-eighth of an inch or thereabouts at the bottom, so as to receive the tra'verse planking.

The blocks for paving the gutter are to be sawed to a uniform level, so that a channel-way for surface-water will be formed about six inches outside of curb-stone line.

Laying the pavement.—The foundation having been brought to a proper crown and smoothness is then to be covered with sound common pine boards, as above described, and the transverse planking placed thereon, thus forming the foundation for the blocks, which are to be set on end in paral'el courses transversely with the line of the street, each block, before placing, to be dipped to half its length in hot coal-tar and pitch, and then properly adjusted to the compound flooring. The spaces between each course of blocks are to be filled with clean gravel and a mixture of coal-tar and pitch, and firmly packed by means of tools used for such work. The gravel is to be dry and warm, so as not
31 to chill the mixture of tar and pitch, which is to be applied hot and in such quantities as will thoroughly penetrate and fill all the joints. The whole surface of the pavement is to be covered with this mixture hot, and then immediately covered with clean sand and gravel about ($\frac{3}{4}$) three-fourths of an inch thick.

Old material.—All old materials which it becomes necessary to remove shall be the property of the contractor, and shall be by him removed from the line of the work. All rubbish, refuse, stone, earth, and sand are to be removed by the contractor from the street as fast as the work progresses.

Dated September 25th, 1869.

GEO. W. TUBBS.

32 Proposals for paving Garden street with Brocklebank and Train-or's wood pavement from Maple avenue to Washington avenue, made this twentieth (20th) day of October, 1869, by George W. Tubbs.

Awarded to Geo. W. Tubbs, Feb'y 18, 1870.

I. I do declare that this New Jersey Wood Paving Company are the only persons interested in this proposal, and that no other person than herein named has any interest in this proposal or in the contract proposed to be taken.

II. I further declare that this proposal is made without any connection with any other person or persons making a proposal for the same work, and is in all respects fair and without collusion or fraud.

III. I refer to the estimate and specification hereunto annexed as forming a part of this proposal, in relation to this contract, dated September 25th, 1869, and will contract to furnish all the necessary material and labor, and perform the above-named work in the manner and the conditions required by the specification above referred to, and upon the annexed terms, to wit:

		Amount.
34	For 6,000 square yards of wooden pavement @ the sum of four dollars and fifty cents ($4.50) per square yard	27,000 00
	For 35 days at $2.25	78 75
		$27,078 75

I will further contract to commence the said work when directed, and finish the same by or before the expiration of the time bid for, unless said work is suspended by order of the city council, and to authorize the said council to deduct from the moneys which may grow due to us under the contract for the above work, the sums specified in section 33 of an ordinance relating to streets and highways, the construction and repair of sidewalks and the public grounds of the city, passed April 27th, 1863, for each and every day the same may be uncompleted after the time above stipulated shall have expired.

GEO. W. TUBBS.

CITY OF ELIZABETH,
Union County, ss:

George W. Tubbs, being duly sworn, say' that the several matters stated in the annexed proposal are in all respects true.

GEO. W. TUBBS.

Sworn and subscribed to this 20th day of October, 186 , before me.
SAMUEL S. MOORE,
Commissioner of Deeds.

34 Know all men by these presents that we, George W. Tubbs, William W. Crane, and Augustus C. Kellogg, are indebted to the City of Elizabeth in the sum of fifteen thousand dollars, lawful money of the United States, to be paid to the said The City of Elizabeth, its successors and assigns, to which payment well and truly to be made we bind ourselves, our and each of our heirs, executors, and administrators, jointly and severally, by these presents, sealed with our seals, and dated this nineteenth day of October, eighteen hundred and sixty-nine.

Whereas the said George W. Tubbs has sent into the city council of the city of Elizabeth a proposal to pave Garden street, from Maple avenue to Washington avenue, with wooden pavement (under the Brocklebank and Trainor patent), for about the sum of twenty-seven thousand dollars, in accordance with the ordinance of said city:

Now, the condition of this obligation is such that the said George W. Tubbs on being awarded the said work shall enter into a contract for the faithful performance of the same, according to the plans and specifications of said work, and shall perform the same in good and workmanlike manner, according to the terms of the said contract and spec-
35 ification and *a* satisfactorily to the city council, or such person or persons as they may appoint; or upon the failure or neglect of the said George W. Tubbs to enter into and execute said contract, if the said William W. Crane and Augustus C. Kellogg, their heirs, executors, or administrators, or either or any of them, shall and do well and truly pay to the said The City of Elizabeth such sums of money as the said The City of Elizabeth shall pay to any person or persons by whom the said work may be done, over and above the amount that the said George W. Tubbs would have been entitled to receive upon the completion

thereof, under and according to the terms of said proposal, then this obligation to be void; else to be and remain in full force and virtue.

GEO. W. TUBBS.
W'M W. CRANE.
AUGUSTUS C. KELLOGG.

Sealed and delivered in the presence of—
SAMUEL S. MOORE.

I do hereby certify the foregoing to be a true copy of the original exhibit in said cause on file in this office.

Witness my hand and official seal, at Trenton, this sixteenth day of October, A. D. 1875.

S. D. OLIPHANT,
Clerk.

35½ (Indorsed:) 2. 78. Paving Garden street, from Maple avenue to Washington avenue. U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 2 on the part of complainants. May 2d, 1872. W. J. Magie, M. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

36 *Complainant's Exhibit No. 3.*

Contract for paving Grove street, from Maple avenue to Washington avenue, with wooden pavement.

Articles of agreement made the twentieth day of April, A. D. 1869, between W. Tubbs, of the city of Elizabeth, in the county of Union and State of New Jersey, of the first part, and the city of Elizabeth of the second part, witnesseth:

That the said party of the first part, for and in consideration of the payments to be made as hereinafter mentioned by the party of the second part, hereby covenant and agree to and with the said party of the second part to pave Grove street, from Maple avenue to Washington avenue, with wooden pavement, where the same has not already been done, in accordance with the specifications of said work, signed by the said party of the first part, and hereunto annexed and making part of this contract, and in accordance with the ordinance of the city of Elizabeth, for the following prices, that is to say, four dollars and fifty cents per square yard for wooden pavement, all laid complete, as mentioned and specified is a proposal for said work dated October 26th, A. D. 1869, upon
37 which the said work was awarded to the said party of the first part.

The work to be done in a workman-like manner, the party of the first part hereby agreeing strictly to observe the requirements of sections 23, 24, 25, and 29 of article 1 of an ordinance of said city, entitled "An ordinance relating to streets and highways, the construction and repair of sidewalks and the public grounds of the city," approved April 15, 1868, under the penalties therein mentioned, and the whole to be completed to the satisfaction and approval of the street commissioners of said city, or such person as the city council may appoint to inspect the said work, within the time specified in said proposal, unless the said time shall be extended by the city council, and then within the time so extended.

And in case the said party of the first part fails to complete said work,

then the said party of the first part agrees to and with the said party of the second part to pay to the said party of the second part, or their successors, as liquidated damages therefor, thirteen dollars per day for each day's neglect to complete said work according to the contract
38 beyond the time so fixed for said completion: and also the *the* sum of two dollars and twenty-five cents for each day that the aggregate time of all the inspector' employed on said work shall exceed thirty days.

And the party of the second part agrees to and with the party of the first part to pay to the party of the first part the sum of two dollars and twenty-five cents for each day that the aggregate time of all the inspector' employed on said work shall be less than thirty days.

All penalties incurred by the said contractor, and expenses for the removal of improper materials, and other expenses on said work incurred by city officers, to be deducted by the street commissioners from the final estimate of the amount due to the contractor on this contract, before the same is presented to the city council, and to be allowed accordingly. The street commissioners shall, upon the refusal or neglect of the said party of the first part to comply with this agreement, be privileged to cause the said work to be done, and the said party of the first part in such case to receive no benefit from this contract, but to be liable for all deficiencies beside said penalties. The street commis-
39 sioner, upon the refusal or neglect of the contractor to remove improper materials on being directed so to do by the street commissioner or person appointed to inspect the said work as aforesaid, to be privileged to cause the same to be removed at the expense of the said contractor, to be deducted as hereinbefore mentioned.

And the said party of the second part hereby promises and agrees to and with the said party of the first part to pay to the said party of the first part, his heirs and assigns, for doing and completing the said work in the manner and according to the terms and conditions of this agreement, the same having first been approved by the street commissioner, in writing, the prices aforesaid, in manner following; this is to say, seventy-five per centum of the same in payments during the progress of said work (the amount of such payments to be determined by the city surveyor and street commissioner), and the balance (twenty-five per centum thereof) to be paid when said work shall have been fully completed and accepted by the said commissioner, said payments to be
40 made in cash. To prevent all disputes, it is hereby agreed that the city surveyor and street commissioner shall, in all cases, determine the amount or quantity of the several kinds of work which are to be paid for under this contract, and the amount of compensation, at contract prices, to be paid therefor. And also the city surveyor shall, in all cases, decide every question which may arise relating to the measurement of any work done under this contract, and his estimate and decision shall be final and conclusive.

In witness whereof the said George W. Tubbs, party of the first part, has hereunto set his hand and seal; and the said The City of Elizabeth has caused its common seal to be affixed hereunto, and the same to be signed by the mayor, on the day and year first above written.

GEO. W. TUBBS.

[L. S.] PH. H. GRIER,
Mayor.

Signed, sealed, and delivered in the presence of—
J. SEIPLE.

41 **Specification of Brocklebank and Trainor pavement for paving Grove street, from Washington avenue to Maple avenue, with wood.**

Preparation of road-bed, &c.—From the line of work shall be removed all paving and other stones; the earth will then be removed to the depth of nine inches below the top line of the contemplated pavement when completed. All inequalities to be brought to a proper grade. Upon this earth foundation is to be placed a layer of sand or gravel to a depth necessary to bring the top of the pavement to a proper grade and so as to give an easy and smooth crown to the top of the street. On this foundation the Brocklebank and Trainor pavement is to be laid. A compound flooring is first formed, consisting of an under or ground layer of sound pine boards one inch thick laid lengthwise with the line of the street, and are to be thoroughly tarred on both sides with hot coal-tar and pitch, the ends resting on similar boards placed transversely from curb to curb; on this layer of boards are to be placed an upper layer of transverse planking or beveled joist one inch thick, one and three-fourths (1¾) inches wide on top, and beveled down so as to give one and one-
42 fourth (1¼) inches on the bottom. Wooden blocks cut so as to be three (3) inches thick, six (6) inches long, having a dovetailed rebate cut on the lower face of the blocks on both sides, three-eight's (⅜) of an inch deep at the top and beveled down to one-eight' (⅛) of an inch or thereabouts at the bottom, so as to receive the transverse planking. The blocks for paving the gutter are to be sawed to a uniform level so as that a channel-way for surface-water will be formed about six inches outside the curbstone line.

Laying the pavement.—The foundation having been brought to a proper crown and smoothness is then to be covered with sound common pine boards as above described, and the transverse planking placed thereon, thus forming the foundation for the blocks which are to be set on end in parallel courses transversely with the line of the street, each block before placing to be dipped to half its length in a mixture of hot coal-tar & pitch, and then properly adjusted to the compound flooring. The spaces between each course of blocks are to be filled with clean gravel and a mixture of hot coal-tar & pitch, and firmly packed by means of tools used for such work. The gravel is to be dry and warm,
so as not to chill the mixture of tar & pitch which is to be ap-
43 plied hot, and in such quantities as will thoroughly penetrate and fill all the joints. The whole surface of the pavement is to be covered with this mixture hot, and then immediately covered with clean sand & gravel about three-quarters (¾) of an inch thick.

Old materials.—All old materials which it becomes necessary to remove shall be the property of the contractor, and shall be by him removed from the line of the work. All rubbish, refuse stone, earth, & sand are to be removed by the contractors from the street as fast as the work progresses.

Dated Sept. 25th, 1869.

GEO. W. TUBBS.

Proposals for paving Grove street, from Washington avenue to Maple avenue, with Brocklebank & Trainor wood pavement, made this twentieth (20th) day of October, 1869, by George W. Tubbs.

I do declare that the New Jersey Wood-Paving Company are the only persons interested in this proposal, and that no other person than herein

named has any interest in this proposal or in the contract pro-
44 posed to be taken. Further declare that this proposal is made without any connection with any other person or persons making a proposal for the same work, and is in all respects fair and without collusion or fraud. Refer to the estimates and specifications hereto annexed as forming a part of this proposal in relation to this contract, dated September 25th, 1869, and will contract to furnish all the necessary materials and labor, and perform the above-named work in the manner and the conditions required by the specification above referred to and upon the annexed terms, to wit:

	Amount.
For 3,700 square yards of wooden pavement the sum of four dollars and fifty ($4.50) cents per square yard.....	$16,650 00
For 30 days, at $2.25.....	67 50
	$16,717 50

I will further contract to commence the said work when directed, and finish the same by or before the expiration of the time bid for, unless said work is suspended by order of the city council, and to authorize the said council to deduct from the moneys which may grow due to us under the contract for the above work the sum specified in section 33 of an ordinance relating to streets and highways, the construction and repair of sidewalks and the public grounds of the city, passed
45 April 27, 1863, for each and every day the same may be uncompleted, after the time above stipulated shall have expired.

GEORGE W. TUBBS.

CITY OF ELIZABETH,
Union County, ss:

George W. Tubbs, being duly sworn, say' that the several matters stated in the annexed proposal are in all respects true.

GEORGE W. TUBBS.

Sworn and subscribed to this 20th day of October, 1869, before me.

SAMUEL S. MOORE,
Commissioner of Deeds.

Know all men by these presents that we, George W. Tubbs, William W. Crane, and Augustine C. Kellogg, are indebted to the City of Elizabeth in the sum of eight thousand dollars, lawful money of the United States, to be paid to the said The City of Elizabeth, its successors and assigns, to which payment, well and truly to be made, we bind ourselves, our and each of our heirs, executors, and administrators, jointly and severally, by these presents, sealed with our seals and dated this nineteenth day of October, eighteen hundred and sixty-nine.

46 Whereas the said George W. Tubbs has sent into the city council of the city of Elizabeth a proposal to pave Grove street from Washington avenue to Maple avenue with wooden pavement, under the Brocklebank and Trainor patent, for about the sum of sixteen thousand six hundred and fifty dollars, in accordance with the ordinance of said city.

Now, the condition of this obligation is such, that if the said George W. Tubbs, on being awarded the said work, shall enter into a contract for the faithful performance of the same, according to the plans and specifications of said work, and shall perform the same in good and

workmanlike manner, according to the terms of the said contract and specification, and satisfactorily to the city council, or such person or persons as they may appoint, or upon the failure or neglect of the said George W. Tubbs to enter into and execute said contract, if the said William W. Crane and Augustus C. Kellogg, their heirs, executors, or administrators, or either or any of them, shall and do well and truly pay to the said The City of Elizabeth such sums of money as the said The City of Elizabeth shall pay to any person or persons by whom the said work may be done, over and above the amount that the said George W.
47 Tubbs would have been entitled to receive upon the completion thereof under and according to the terms of said proposal, then the obligation to be void, else to be and remain in full force and virtue.

GEORGE W. TUBBS.
W'M W. CRANE.
AUGUSTUS C. KELLOGG.

Sealed and delivered in the presence of—
SAMUEL S. MOORE.

I do hereby certify the foregoing to be a true copy of the original exhibit in said cause on file in my office.

Witness my hand and official seal, at Trenton, this sixteenth day of October, A. D. 1875.

L. D. OLIPHANT,
Clerk.

48 *Complainant's Exhibit No. 4.*

Contract for regulating, grading, and curbing Newark avenue, from Broad street to the line of Clinton Township, and paving the same with wooden pavement.

Articles of agreement made the 18th day of March, A. D. 1870, between George W. Tubbs, of the city of Elizabeth, in the county of Union, and State of New Jersey, of the first part, and the city of Elizabeth of the second part, witnesseth:

That the said party of the first part, for and in consideration of the payments to be made as hereinafter mentioned by the party of the second part, hereby covenants and agrees to and with the said party of the second part to regulate, grade, and curb Newark avenue from Broad street to the line of Clinton Township, and pave the same with wooden pavement where the same has not already been done.

49 The excavation below the grade of the street, preparatory to laying the pavement, to be made without extra charge, in accordance with the specifications of said work signed by the said party of the first part and hereunto annexed, and making part of this contract, and in accordance with the ordinance of the city of Elizabeth, for the following prices, that is to say, four dollars and fifty cents per square yard for payment laid complete; twenty-five cents per cubic yard for earth excavation. This not to include any excavation below grade of the street. Fifty cents per lineal foot for curb, as mentioned and specified in a proposal for said work, dated March 9th, A. D. 1870, upon which the said work was awarded to the said party of the first part.

50 The work to be done in a workmanlike manner; the party of the first part hereby agreeing strictly to observe the require-

ments of sections 23, 24, 25, and 29 of article 1 of an ordinance of said city, entitled "An ordinance relating to street and highway, the construction and repair of sidewalks, and the public grounds of the city, approved April 15, 1863," under the penalties therein mentioned, and the whole to be completed to the satisfaction and approval of the street commissioner of said city, or such person as the city council may appoint to inspect the said work within the time specified in said proposal, unless the said time shall be extended by the city council, and then, within the time so extended.

And in case the said party of the first part fails so to complete said work, then the said party of the first part agrees to and with the
51 said party of the second part to pay to the said party of the second part, or their successors, as liquidated damages therefor, one hundred and sixty-eight dollars per day for each day's neglect to complete said work according to this contract beyond the time so fixed for said completion; and also the sum of three dollars and fifty cents for each day that the aggregate time of all the inspectors employed on said work shall exceed one hundred and twenty-five days.

And the party of the second part agrees to and with the party of first part to pay to the party of the first part the sum of three dollars and fifty cents for each day that the aggregate time of all the inspectors employed on said work shall be less than one hundred & twenty-five days.

52 All penalties incurred by the said contractor, and expenses for the removal of improper materials, and other expenses on said work incurred by city officers, to be deducted by the street commissioner from the final estimate of the amount due to the contractor on
53 this contract before the same is presented to the city council and to be allowed accordingly.

The street commissioner shall, upon the refusal or neglect of the said party of the first part to comply with this agreement, be privileged to cause the said work to be done, and the said party of the first part in such case to receive no benefit from this contract, but to be liable for all deficiencies beside said penalties.

The street commissioner, upon the refusal or neglect of the said contractor to remove improper materials, on being directed so to do by the street commissioner or person appointed to inspect the said work as aforesaid, to be privileged to cause the same to be removed at the expense of the said contractor, to be deducted as hereinbefore mentioned.

54 And the said party of the second part hereby promises and agrees to and with the said party of the first part to pay to the said party of the first part, his heirs and assigns, for doing and completing the said work in the manner and according to the terms and conditions of this agreement, the same having first been approved of by the street commissioner, in writing, the prices aforesaid in manner following, that is to say, seventy-five per centum of the same in monthly payment during the progress of said work (the amount of such payments to be determined by the city surveyor and street commissioner), and the balance (twenty-five per centum thereof) to be paid when said work shall have been fully completed and accepted by the said
55 commissioner; said payments to be made in cash.

To prevent all disputes, it is hereby agreed that the city surveyor and street commissioner shall, in all cases, determine the amount or quantity of the several kinds of work which are to be paid for under this contract and the amount of compensation at contract prices to be

paid therefor. And also, the said city surveyor shall in all cases decide every question which may arise relating to the measurement of any work done under this contract, and his estimate and decision shall be final and conclusive.

In witness whereof the said George W. Tubbs, party of the first part, has hereunto set his hand seal, and the said The City of Elizabeth has caused its common seal to be affixed hereunto and the same to be signed by the mayor on the day and year first above written.

56 GEO. W. TUBBS. [SEAL.]
PH. H. GRIER, *Mayor.* [SEAL.]

Signed, sealed, and delivered in the presence of—(in the 4th line, 3rd page, 29 written over 28.)

J. SEIPLE.

57 *Specification for laying Brocklebank and Trainer pavement.*

All paving-stones and other materials necessary to be renewed shall be taken up and removed from the line of street. The subsoil and other matter is then to be excavated and renewed, of the full width of the proposed pavement, to a depth of nine inches below the top of the proposed new pavement.

Care must be taken in excavating to preserve the proper crown.

Upon this earth foundation is to be placed a layer of sand or gravel to a depth necessary to bring the top of the proposed new pavement to a proper grade, so as to give an easy and smooth crown to the street.

On this foundation the Brocklebank and *and* Trainer pavement is to be laid. A compound of flooring is first formed, consisting of an
58 under on ground layer of sound pine boards, one inch thick, laid lengthwise with the line of the street, and are to be thoroughly coated on both sides with a mixture of coal-tar and pitch, the ends resting on similar boards placed transversely from curb to curb. On this layer of boards are to be placed an upper layer of transverse planking, or level joist, one inch thick, one and three-fourths (1¾) inches on the top, and levelled down to, so as to give one and one-fourth (1¼) inches on the bottom. Upon the foundation thus laid will be placed the pavement, which shall consist of white-pine blocks, free from rot or sap, having a thickness, uniformly, of three (3) inches, and a length of six (6) inches, and a width of not less than six (6) inches, having a dove-
59 tail rebate cut in the lower face of the blocks, on both sides, ⅜ of one inch at the top, and levelled down to ⅛ of an inch at the bottom, so as to receive the transverse planking.

The blocks for paving the gutter are to be sawed to a uniform level, so that a channel for surface-water will be formed about 6 inches outside the curb line.

The blocks, before being set, are to be dipped in a mixture of coal-tar and pitch, and then to be set on end in a line at right angles with the street, except at intersections. Care must be taken that the joists be broken, and also that all rot or sap be trimmed off.

The space' between each row of blocks are now to be filled with clean gravel and a mixture of coal-tar and pitch, thoroughly mixed
60 and compactly rammed by means of pavers, rammers, and an iron blade prepared to fit the joints, which blade, during the process of ramming, shall not be moved more than nine inches between the blows. After the blocks have been thus set and thoroughly rammed between the rows, the entire surface of the roadway shall be slushed

with a heated composition of coal-tar and pitch, and immediately covered with sound gravel and clean sand, in equal proportions, to a depth of ¾ of one inch.

Old materials.—All old materials, such as gutter-stones and cobble-stones, which it becomes necessary to remove, may be taken up and removed by the respective owners thereof, provided such removal is made in advance of the work *of the work* of grading the street.

61 If stones are not taken up and removed by the owners within three days after being notified by the inspector, they shall be considered as the property of the contractor, and the same shall be immediately removed by him from the line of work.

A free, clear, and sufficient passage shall be left upon the sidewalk at all times after the same has been graded.

Clearing up.—As the street is graded and paved, the sidewalk graded, and the work completed, the contractor shall remove all refuse stones, boulders, stumps, rubbish, or other materials from the street, and leave all roads and places free, clear, and in good order, and until this is done, and a certificate of the street commissioner to the effect that all

62 surplus materials have been removed from the line of the work, the same shall not be considered as completed.

The work to be commenced by such time as may be designated by the street commissioner, and to be finished within the number of days bid for by the contractor, the contractor giving the street commissioner at least two days' notice before breaking ground; curb to be set or reset on each side of the street to the established grade, and all stones furnished shall not be less than 3 feet long, 4 inches thick, and 16 inches wide throughout, to be of the best quality North River bluestone, and to be cut, prepared, and laid in the following manner, that is to say:

The top of the stone shall be cut to a level of 1 inch, the front to be

63 cut smooth and to a fair line the whole depth of the gutter; the ends from top to bottom to be truly squared, so as to form close and even joints, the front so laid as to present a fair and unbroken line; 8 inches of the curb shall be laid above the kennel, and not less than 8 inches below it.

All curb, set or reset, to be filled, and to be backed up with at least 6 inches of sand, corners to be turned to the line in all intersecting streets where necessary.

The present curb to be used in all cases when the same is unbroken.

All materials furnished and all work done which do not strictly conform to this specification or to the city ordinance shall be removed forthwith, and other materials and work done that shall be in accordance therewith; and in case of the neglect or refusal of the contractor

64 or those employed by him to remove such materials, the street commissioner shall cause the same to be removed at the expense of the contractor, and to deduct the cost of such removal and all other expenses thereon from the amount of the contract.

The right to construct any sewer or sewers or receiving basins and culverts in said street, and to grant permits for house-connections therewith, at any time previous to the grading of the street for the laying of the pavement over the line of the same, is expressly reserved to the city council; and said contractor shall not interfere with, or place any impediment in the way of, any person or persons who may be engaged in the construction of such sewer, or in making any connection there-

65 with, or in setting or resetting any curb or gutter-stones on the line of the street, under the direction of the street commissioner or otherwise.

The contractor will be required to readjust the manhole heads over the line of the sewer to conform to the level of the pavement, before the pavement is laid down, at such price as may be agreed upon with the engineer. He shall also provide for the flow of all drains or watercourses interrupted during the progress of the work at his own expense.

All loss or damage arising out of the nature of the work to be executed, from accidents or from the action of the elements, or the injury or breaking of gas and water pipes, to be sustained by the contractor.

Inspector.—An inspector will be placed upon the work, and be
66 retained at the pleasure of the city council until the same is fully completed; and should the work be prosecuted from more than one place at the same time, an inspector will be placed at each point to supervise the same; it being understood that the time bid in the proposals refers to the aggregate time of all the inspectors who may be appointed on the work, and not to single, consecutive days; it being further understood that the contractor shall be entitled to receive the sum of $3.50 cents per day for each and every day that the aggregate time of all the inspectors may be less than the time specified in the bid for the completion of the work; and there shall be deducted from the final payment of such contractors, in addition to the penalties prescribed by the ordinances of the city, the sum paid for the inspectors' wages,
67 for each and every day the aggregate time of all the inspectors employed upon said work may exceed the time stipulated in the bid for its completion.

Bidders will state the price per lineal foot for furnishing and setting curb, the price per square yard for the trap-block pavement, and the price per square foot for furnishing and laying bridge stones; also the time taken for the completion of the work, which will be tested at the rate of $3.50 per day. These prices are to cover the expense of regulating the curb on the whole line of the work, the expense of excavation or filling, also the furnishing of all the necessary materials and labor for the completion of all the work.

Double price will be allowed for corners that is bid for curb.

Bids containing more than is required to be bid for will be rejected as informal.

No certificate for payment will be given for a portion of the
68 work done which is not accompanied by the inspector's certificate.

The contractor shall be liable for keeping in good repair the whole of the work executed by him for a period of nine months from the date of completion. The quantities given are those that have been estimated approximately for the work.

The city council do not hold themselves responsible for the same, and bidders are required to examine the plans and ground and judge for themselves.

Any omissions, alterations, or additions made by direction of the city authorities to the work during its progress are in no way to vitiate the contract, but the amount and value to be satisfactorily agreed upon in writing, with the street commissioner or engineer, before such work is done, otherwise no extra bills will be allowed.

69 All extra bills must be presented and approved before the final estimate is given.

In case of an alteration, detention, or suspension of the work, caused by the neglect or by the order of any officer of the corporation after the contract has been duly awarded, thereby causing a real or supposed loss to the contractor, the same must be reported to the city coun-

cil at the first council meeting after date of such alteration, detention, or suspension. Otherwise, no allowance will be made therefor.

City surveyor's and inspector's certificates of work done must be presented at the street commissioner's office three days previous to the regular meeting of the city council.

No certificate will be given for any one portion of the street unfinished.

GEO. W. TUBBS.

69½ Contract awarded to Geo. W. Tubbs, March 18, 1870.

J. SEIPLE,
City Clerk.

Proposals for regulating, grading, and curbing Newark avenue from Broad street to the line of Clinton Township, and pave the same with the Brocklebank and Trainer patent wood pavement, made this ninth day of March, 1870, by Geo. W. Tubbs, of Elizabeth, New Jersey.

1. I do declare that the New Jersey Wood Paving Company are the only persons interested in this proposal, and that no other person than herein named has any interest in this proposal, or in the contract proposed to be taken.

2. I further declare that this proposal is made without any con-
70 nection with any other person or persons making a proposal for the same work, and is in all respects fair, and without collusion or fraud.

3. I refer to the estimates and specification as forming a part of this proposal issued by the street commissioner for proposals in relation to this contract dated Feb. 12th, 1870, and I will contract to furnish all the necessary material and labor, and perform the above-named
70½ work in the manner and the conditions required by the specifications above referred to, and upon the annexed terms, to wit:

	Amount.
For 35,000 square yards of pavement, at $4 $^{50}_{100}$ per square yard	$157,500 00
For 21,000 cubic yards of excavation, at 25 cents per cubic yard	5,250 00
For 10,000 lineal feet of curb, at 50 c'ts per lineal foot	5,000 00
For 125 days, at $3 $^{50}_{100}$ c'ts per lineal foot	437 50
	168,187 50

I will further contract to commence the said work when directed, and finish the same by or before the expiration of the time bid for, unless said work is suspended by order of the city council, and to authorize the said council to deduct from the moneys which may grow due to me under the contract for the above work, the sum specified in section
70½ 33 of an ordinance relating to street' and highways, the construction and repair of sidewalks, and the public grounds of the city, passed April 27, 1863, for each and every day the same may be uncomplted, after the time above stipulated shall have expired.

GEORGE W. TUBBS.

71 CITY OF ELIZABETH,
Union County, ss:

George W. Tubbs, being duly sworn, say' that the several matters stated in the annexed proposal are in all respects true.

GEO. W. TUBBS.

Sworn and subscribed to this ninth day of March, 1870.

SAMUEL J. MOORE,
Commissioner of Deeds.

[Rev. stamp 5 c'ts.]

72 Know all men by these presents that we, George W. Tubbs, William W. Crane, Augustus C. Kellogg, and William F. Day, are indebted to the city of Elizabeth in the sum of fifty thousand dollars, lawful money of the United States, to be paid to the said The City of Elizabeth, its successors and assigns, to which payment well and truly to be made we bind ourselves, our and each of our heirs, executors and administrators, jointly and severally, by these presents, sealed with our seals, and dated this ninth day of March, eighteen hundred and seventy.

Whereas the said George W. Tubbs has sent into the city council of the city of Elizabeth a proposal to regulate, grade, & curb, and pave Newark avenue from Broad street to the line of Clinton Township for about the sum of one hundred and sixty-eight thousand one
73 hundred & eighty-seven dollars and fifty cents, in accordance with the ordinances of said city:

Now, the condition of this obligation is such that if the said George W. Tubbs, on being awarded the said work, shall enter into a contract for the faithful performance of the same, according to the plans and specifications of said work, and shall perform the same in good and workmanlike manner, according to the terms of the said contract and specification, and satisfactorily to the city council, or such person or persons as they may appoint, or upon the failure or neglect of the said George W. Tubbs to enter into and execute said contract, if the said George W. Tubbs, William W. Crane, Augustus C. Kellogg, and William F. Day, their heirs, executors, or administrators, or either or
74 any of them, shall and do well and truly pay to the said The City of Elizabeth such sums of money as the said the city of Elizabeth shall pay to any person or persons, by whom the said work may be done, over and above the amount that the said George W. Tubbs would have been entiled to receive upon the completion thereof, under and according to the terms of said proposal, then this obligation to be void, else to be and remain in full force and virtue.

GEO. W. TUBBS. [SEAL.]
W'M W. CRANE.
AUGUSTUS C. KELLOGG,
By WILLIAM F. DAY,
Attorney in fact.
WILLIAM F. DAY.

Sealed and delivered in the presence of—
SAMUEL J. MOORE.

75 I do hereby certify the foregoing to be a true copy of the original exhibit in said cause on file in my office.

Witness my hand and official seal at Trenton this sixteenth of October, A. D. 1875.

[SEAL.] S. D. OLIPHANT, *Clerk.*

76 (Endorsed:) Grading, curbing, and paving Newark avenue from Broad st. to Clinton Township. U. S. circuit court, district of New Jersey. The American Nicholson Pavement Company vs. The City of Elizabeth et al. In equity. Exhibit No. 4, on the part of complainants. May 2, 1872. W. J. Magee. M. Filed Nov. 10, 1872. S. D. Oliphant, clerk.

77 *Complainants' exhibit No. 5.*

Contract for paving Sherman avenue from Newark avenue to the city line with wooden pavement, under the Brocklebank and Trainor patent.

Articles of agreement, made the seventh day of September, A. D. eighteen hundred and seventy, between Geo. W. Tubbs, of the city of Elizabeth, in the county of Union and State of New Jersey, of the first part, and the city of Elizabeth of the second part, witnesseth:

That the said party of the first part, for and in consideration of the payments to be made, as hereinafter mentioned, by the party of the second part, hereby covenant and agree to and with the said party of the second part to pave Sherman avenue from Newark avenue to the city line, with wooden pavement, under the Brocklebank & Trainor patent, in accordance with the specifications of said work, signed by the said party of the first part, and hereunto annexed and making part
78 of this contract, and in accordance with the ordinance of the city of Elizabeth, for the following prices, that is to say, four dollars and fifty cents per square yard for wood pavement, thirty-five cents per cubic yard for earth excavation, fifty-five cents per lineal foot for curb, all complete, as mentioned and specified in a proposal for said work, dated September 5th, A. D. 1870, upon which the said work was awarded to the said party of the first part.

The work to be done in a workmanlike manner; the party of the first part hereby agreeing strictly to observe the requirements of sections 23, 24, 25, and 29 of article 1 of an ordinance of said city entitled "An ordinance relating to streets and highways, the construction and repair of sidewalks and the public grounds of the city," approved April 15, 1868, under the penalties therein mentioned, and the whole to be completed to the satisfaction and approval of the street commis-
79 sioner of said city, or such person as the city council may appoint to inspect the said work, within the time specified in said proposal, unless the said time shall be extended by the city council, and then within the time so extended.

And in case the said party of the first part fails so to complete said work, then the said party of the first part agrees to and with the said party of the second part to pay to the said party of the second part, or their successors, as liquidated damages therefor, twenty-six dollars per day for each day's neglect to complete said work according to this contract, beyond the time so fixed for said completion; and also the sum of three dollars and fifty cents for each day that the aggregate time of all the inspectors employed on said work shall exceed thirty days.

And the party of the second part agrees to and with the party of the first part to pay to the party of the first part the sum of three dollars and fifty cents for each day that the aggregate time of all the in-
80 spectors employed on said work shall be less than thirty days.

All penalties incurred by the said contractor, and expenses for the removal of improper materials, and other expenses on said work incurred by city officers, to be deducted by the street commissioner from the final estimate of the amount due to the contractor on this contract before the same is presented to the city council, and to be allowed accordingly. The street commissioner shall, upon the refusal or neglect of the said party of the first part to comply with this agreement, be privileged to cause the said work to be done, and the said party of the first part in such case to receive no benefit from this contract, but to be

liable for all deficiencies beside said penalties. The street commissioner, upon the refusal or neglect of the said contractor to remove improper materials on being directed so to do by the street commissioner or person appointed to inspect the said work as aforesaid, to be
81 privileged to cause the same to be removed at the expense of the said contractor, to be deducted as hereinbefore mentioned.

And the said party of the second part hereby promises and agrees to and with the said party of the first part to pay to the said party of the first part, his heirs and assigns, for doing and completing the said work in the manner and according to the terms and conditions of this agreement, the same having first been approved of by the street commissioner in writing, the prices aforesaid, in manner following, that is to say, seventy-five per centum of the same in payments during the progress of said work (the amount of such payments to be determined by the city surveyor and street commissioner), and the balance (twenty-five per centum thereof) to be paid when said work shall have been fully completed and accepted by the said commissioner; said payments to be made in cash.

To prevent all disputes, it is hereby agreed that the city sur-
82 veyor and street commissioner shall, in all cases, determine the amount or quantity of the several kinds of work which are to be paid for under this contract, and the amount of compensation at contract prices to be paid therefor. And, also, the said city surveyor shall, in all cases, decide every question which may arise relating to the measurement of any work done under this contract, and his estimate and decision shall be final and conclusive.

In witness whereof the said George W. Tubbs, party of the first part, hath hereunto set his hand and seal, and the said The City of Elizabeth has caused its common seal to be affixed hereunto, and the same to be signed by the mayor, on the day and year first above written.

GEO. W. TUBBS.
PH. H. GRIER, [L. S.]
Mayor.

Signed, sealed, and delivered in the presence of—
J. LEIPLE.

83 *Specification for laying Brocklebank & Trainor pavement.*

All paving stones and other materials necessary to be removed shall be taken up and removed from the line of the street. The subsoil and other matter is then to be excavated and removed off the full width of the proposed pavement. Care must be taken in excavating to preserve the proper crown. Upon this earth foundation is to be placed a layer of sand or gravel to a depth necessary to bring the top of the proposed new pavement to a proper grade and so as to give an easy and smooth crown to the street. On this foundation the Brocklebank and Trainor pavement is to be laid. A compound flooring is first formed, consisting of an under or ground-layer of sound pine boards, one inch thick, laid lengthwise with the line of the street, and are to be coated on
84 both sides with a mixture of coal-tar and pitch, the ends resting on similar boards placed transversely from curb to curb. On this layer of boards are to be placed an upper layer of transverse planking or beveled joist, one inch thick, one and three-fourths inches wide on the top, and beveled down so as to give one and one-fourth inches on the bottom. Upon the foundation thus laid will be placed the pavement, which shall consist of white-pine blocks, free from rot or sap, hav-

ing a thickness uniformly of three (3) inches, and a length of six (6) inches, and a width of not less than six (6) inches, having a dovetailed rebate cut in the lower face of the blocks on both sides, three-eighths of one inch at the top, and beveled down to one-eighth of an inch at the bottom, so as to receive the transverse planking.

The blocks for paving the gutter are to be sawed to a uniform bevel, so that a channel for surface-water will be formed about six inches outside the curb-line. The blocks before being set are to be dipped
85 in a mixture of coal-tar and pitch, and then to be set on an end in a line at right angles with the line of the street, except at intersections. Care must be taken that the joints be broken and also that all rot or sap be trimmed off. The space between each row of blocks are now to be filled with a mixture of coal-tar and pitch thoroughly mixed and compactly rammed by means of pavers' rammers, and an iron blade prepared to fit the joints, which blade during the process of ramming shall not be moved more than nine inches between the blows.

After the blocks have been thus set and thoroughly rammed between the rows, the entire surface of the roadway shall be slushed with a heated composition of coal-tar and pitch, and immediately covered with sound gravel and clean sand, in equal proportions, to a depth of three-quarters of one inch; the work to be commenced by such time as may be
86 designated by the street commissioners, and to be finished within the number of days bid for by the contractor, the contractor giving the street commissioner at least two days' notice before breaking ground. Curb to be set or reset, on each side of the street, to the established grade, and all stones furnished shall not be less than 3 feet long, 4 inches thick, and 16 inches wide throughout, to be of the best quality North River bluestone, to be cut, prepared, and laid in the following manner, that is to say: The top of the stone shall be cut to a level of 1 inch, the front to be cut smooth and to a fair line the whole depth of the gutter; the ends, from top to bottom, to be truly squared, so as to form close and even joists, the front so laid as to present a fair and unbroken line; 8 inches of the curb shall be laid above the kennel, and not less than 8 inches below it.

All curb, set or reset, to be filled, and to be backed up with at least 6 inches of sand. Corners to be turned to the line in all intersect-
87 ing streets where necessary. The present curb to be used in all cases where the same is unbroken.

Old materials.—All old materials, such as gutter-stones and cobble-stones, which it becomes necessary to remove, may be taken up and removed by the respective owners thereof, provided such removal is made in advance of the work of grading the street. If said stones are not taken up and removed by the owners within three days after being notified by the inspector, they shall be considered as the property of the contractor, and the same shall be immediately removed by him from the line of the work. A free, clear, and sufficient passage shall be left upon the sidewalk at all times after the same has been graded.

Clearing up.—As the street is graded and paved, the sidewalk graded, and the work completed, the contractor shall remove all refuse stones, boulders, stumps, rubbish, or other materials from the street, and
88 leave all roads and places free, clear, and in good order, and until this is done, and a certificate of *of* the street commissioner of the effect that all surplus materials have been removed from the line of the work, the same will not be considered as completed.

All materials furnished and all the work done, which do not strictly conform to this specification, or to the city ordinance, shall be removed

forthwith, and other materials and work done that shall be in accordance therewith; and in case of the neglect or refusal of the contractor, or those employed by him, to remove such materials, the street commissioner shall cause the same to be removed at the expense of the contractor, and to deduct the cost of such removal and all other expenses thereon from the amount of the contract. The right to construct any sewer or sewers, or receiving-basins and culverts, in said street, and to grant permits for house-connections therewith, at any time previous to the grading of the street for the laying of the pavement over the line of the same, is expressly reserved to the city council; and said contractor shall not interfere or place any impediment in the way of any person or persons who may be engaged in the construction of such sewer, or in making any connection therewith, or in setting or resetting any curb or gutter stones on the line of the street, under the direction of the street commissioner or otherwise.

89

The contractor will be required to readjust the manhole-heads over the line of the sewers, to conform to the level of the pavement before the pavement is laid down, at such price as may be agreed upon with the engineer; he shall also provide for the flow of all drains or watercourses interrupted during the progress of the work at his own expense.

All loss or damage arising out of the nature of the work to be executed, from accidents or from the action of the elements, or the injury or breaking of the gas and water pipes, to be sustained by the contractor.

90

Inspector.—An inspector will be placed upon the work, and retained at the pleasure of *of* the city council until the same be fully completed; and should the work be prosecuted from more than one place at the same time an inspector will be placed at each point to supervise the same, it being understood that the time bid in the proposals referes to the aggregate time of all the inspectors who may be appointed on the work, and not to single consecutive; it being further understood that the contractor shall be entitled to receive the sum of three dollars and fifty cents per day for each and every day that the aggregate time of all the inspectors may be less than the time specified in the bid for the completion of the work; and there shall be deducted from the final payment of such contractor, in addition to the penalties prescribed by the ordinances of the city, the sum paid for the inspectors' wages for each and every day the aggregate time of all the inspectors employed upon said work may exceed the time stipulated in the bid for its completion.

91

Bidders will state the price per lineal foot for furnishing and setting curb, the price per square yard for the Brocklebank & Trainor pavement, and the price per square foot for furnishing and laying bridgestone; also, the time taken for the completion of the work will be tested at the rate of $3.50 per day. These prices are to cover the expense of regulating the curb on the whole line of the work, the expense of excavation or filling, also the furnishing of all the necessary materials and labor for the completion of all the work.

Double price will be allowed for corners that are bid for curb.

Bids containing more than is required to be bid for will be rejected as informal.

No certificate for payment will be given for a portion of the work done which is not accompanied by the inspector's certificate.

92

The contractor shall be liable for keeping in good repair the whole of the work executed by him for a period of twelve months

from the date of completion. The quantities given are those that have been estimated approximately for the work. The city council do not hold themselves responsible for the same, and bidders are required to examine the plans and ground and judge for themselves. Any omissions, alterations, or additions made by the direction of the city authorities to the work during its progress are in no way to vitiate the contract, but the amount and value to be satisfactorily agreed upon, in writing, with street commissioner or engineer before such work is done; otherwise no extra bills will be allowed. All extra bills must be presented and approved before the final estimate is given.

In case of any alterations, directions, or suspension of the work, caused by the neglect or by the order of any officer of the corporation after the contract has been duly awarded, thereby causing a real
93 or supposed loss to the contractor, the same must be reported to the city council at the first council meeting after date of such alterations, detention, or suspension, otherwise no allowance will be made therefor. City surveyor's and inspector's certificates of work must be presented at the street commissioner's office three days previous to the regular meeting of the city council. No certificates will be given for any one portion of the street unfinished.

L. H. HIGGINS,
Street Commissioner, Elizabeth.
GEO. W. TUBBS.

Proposals for paving Sherman avenue, from Newark avenue to the city line, with wood, under the Brocklebank and Trainor patent wood pavement, made this fifth (5th) day of September, 1870, by Geo. W. Tubbs.

94 1. I do declare that the New Jersey Wood-Paving Company are the only persons interested in this proposal, and that no other person than herein named has any interest in this proposal, or in the contract proposed to be taken.

2. I further declare that this proposal is made without any connection with any other person or persons making a proposal for the same work, and is in all respects fair and without collusion or fraud.

3. I refer to the estimate and specification as forming a part of this proposal, issued by the street commissioner for proposals, in relations to this contract, dated August thirteenth, 1870, and will contract to furnish all the necessary material and labor, and perform the above-named work in the manner and conditions required by the specification above referred to, and upon the annexed, to wit:

95

	Amount.
For four thousand and seven hundred yards of wood pavement, at $4.50 per y'd,	21,150 00
For nine thousand and five hundred cubic yards of excavation, at 35 c'ts p'r y'd	3,325 00
For two thousand lineal feet of curb, at fifty-five cents per foot	1,100 00
For thirty days' inspection, at three dollars and fifty cent' per day	105 00
	25,680 00

Awarded to Geo. W. Tubbs, Sept. 7, 1870.

I will further contract to commence the said work when directed, and finish the same by or before the expiration of the time bid for, unless

said work is suspended by order of the city council, and to authorize the said council to deduct from the moneys which may grow due to me under the contract for the above work the sum specified in section
96 33 of an ordinance relating to streets and highways, the construction and repair of sidewalks and the public grounds of the city, passed April 27, 1863, for each and every day the same may be uncompleted after the time above stipulated shall have expired.

GEO. W. TUBBS.

CITY OF ELIZABETH, *Union County, ss:*

George W. Tubbs, being duly sworn, says that the several matters stated in the annexed proposal are in all respects true.

GEO. W. TUBBS.

Sworn and subscribed to this fifth day of September, 1870, before me.

ANDREW DUTCHER,
M. C. C.

97 Know all men by these presents that we, George W. Tubbs, William W. Crane, & Andrew Dutcher, of the city of Elizabeth, New Jersey, are indebted to the City of Elizabeth in the sum of ten thousand dollars, lawful money of the United States, to be paid to the said The City of Elizabeth, its successors and assigns, to which payment well and truly to be made we bind ourselves, our and each of our heirs, executors, and administrators, jointly and severally, by these presents, sealed with our seals, and dated this first day of September, eighteen hundred and seventy.

Whereas the said George W. Tubbs has sent into the city council of the city of Elizabeth a proposal to pave Sherman avenue, from Newark avenue to the city line, with wood, under the Brocklebank and Trainer patent wood-pavement, for the sum of twenty-five thousand six hundred and eighty dollars, in accordance with the ordinances of said city:

98 Now the condition of this obligation is such that if the said George W. Tubbs, on being awarded the said work, shall enter into a contract for the faithful performance of the same, according to the plans and specifications of said work, and shall perform the same in good and workman-like manner, according to the terms of the said contract and specifications, and satisfactorily to the city council, or such person or persons as they may appoint, or upon the failure or neglect of the said Geo. W. Tubbs to enter into and execute said contract, if the said Geo. W. Tubbs, William W. Crane, and Andrew Dutcher, their heirs, executors or administrators, or either or any of them, shall, and do well and truly pay to the said The City of Elizabeth such sums of money as the said The City of Elizabeth shall pay to any person or persons by whom the said work may be done, over and above the amount that the said George W. Tubbs would have been entitled to re-
99 ceive upon the completion thereof under and according to the terms of said proposal, then this obligation to be void; else to be and remain in full force and virtue.

GEO. W. TUBBS.
W'M W. CRANE.
ANDREW DUTCHER.

Sealed and delivered in the presence of—
EDWARD J. MCGRATH.

I do hereby certify the foregoing to be a true copy of the original exhibit in said cause on file in my office.

Witness my hand and official seal, at Trenton, this sixteenth day of October, A. D. 1875.

[SEAL.] S. D. OLIPHANT,
Clerk.

100 *Complainant's Exhibit No. 6.*

Contract for regulating and grading Grier avenue, from the terminus of the Nicolson pavement to Bay Way, and paving with wooden pavement, under the Brockleback and Trainor patent.

Articles of agreement, made the twentieth day of September, A. D. eighteen hundred and seventy, between George W. Tubbs, of the city of Elizabeth, in the county of Union and State of New Jersey, of the first part, and the city of Elizabeth of the second part, witnesseth:

That the said party of the first part, for and in consideration of the payments to be made as hereinafter mentioned by the party of
101 the second part, hereby covenant and agree to and with the said party of the second part to regulate and grade Grier avenue, from the terminus of the Nicolson pavement to Bay Way, and pave with wooden pavement, under the Brocklebank and Trainer patent, in accordance with the specifications of said work signed by the said party of the first part and hereunto annexed and making part of this contract, and in accordance with the ordinance of the city of Elizabeth, for the following prices; that is to say: Four dollars and fifty cents per square yard for wooden pavement, under the Brocklebank and Trainer patent, six cents per lineal foot for resetting curb, fifty-five cents
102 per lineal foot for new curb. All complete, as mentioned and specified in a proposal for said work, dated September 19th, A. D. 1870, upon which the said work was awarded to the said party of the first part.

The work to be done in a workman-like manner, the party of the first part hereby agreeing strictly to observe the requirements of sections 23, 24, 25, and 29 of article 1 of an ordinance of said city, entitled "An ordinance relating to the streets and highways, the construction and repair of sidewalks, and the public grounds of the city, approved April 15, 1868," under the penalties therein mentioned, and the whole to be completed to the satisfaction and approval of the street
103 commissioner of said city, or such person as the city council may appoint to inspect the said work within the time specified in said proposal, unless the said time shall be extended by the city council, and then within the time so extended. And in case the said party of the first part fails so to complete said work, then the said party of the first part agrees to and with the said party of the second part to pay to the said party of the second part, or their successors, as liquidated damages therefor, fifteen dollars per day for each day's neglect to complete said work according to this contract, beyond the time so fixed for said completion; and also the sum of three dollars and
104 fifty cents for each day that the aggregate time of all the inspectors employed on said work shall exceed twenty days.

And the party of the second part agrees to and with the party of the first part to pay to the party of the first part the sum of three dollars and fifty cents for each day that the aggregate time of all the inspectors employed on said work shall be less than twenty days.

All penalties incurred by the said contractor, and expenses for the

removal of improper materials, and the expenses on said work, incurred by city officers, to be conducted by the street commissioner from
105 the final estimate of the amount due to the contractor on this contract before the same is presented to the city council, and to be allowed accordingly.

The street commissioner shall, upon the refusal or neglect of the said party of the first part to comply with the agreement, be privileged to cause the said work to be done, and the said party of the first part in such case to receive no benefit from this contract, but to be liable for all deficiencies, beside said penalties.

The street commissioner, upon the refusal or neglect of the said contractor to remove improper materials on being directed so to do
106 by the street commissioner or person appointed to inspect the said work as aforesaid, to be privileged to cause the same to be removed at the expense of the said contractor, to be deducted as hereinbefore mentioned.

And the said party of the second part hereby promises and agrees to and with the said party of the first part to pay to the said party of the first part, his heirs and assigns, for doing and completing the said work in the manner and according to the terms and conditions of this agreement, the same having first been approved by the street commissioner, in writing, the prices aforesaid in manner following, that is to say:

Seventy-five per centum of the same in payments during the
107 progress of said work (the amount of such payment to be determined by the city surveyor and street commissioner), and the balance (twenty-five per centum thereof) to be paid when said work shall have been fully completed and accepted by the said commissioner; said payments to be made in cash.

To prevent all disputes, it is hereby agreed that the city surveyor and street commissioner shall in all cases determine the amount or quantity of the several kinds of work which are to be paid for under this contract, and the amount of compensation at contract prices to be paid therefor. And also the said city surveyor shall in all cases decide
108 every question which may arise relating to the measurement of any work done under this contract, and his estimate and decision shall be final and conclusive.

In witness whereof the said George W. Tubbs, party of the first part, has hereunto set his hand and seal, and the said The City of Elizabeth has caused its common seal to be affixed hereunto and the same to be signed by the mayor on the day and year first above written.

GEO. W. TUBBS. [L. S.]
PH. H. GRIER, [L. S.]
Mayor.

Signed, sealed, and delivered in the presence of—
J. SEIPLE.

109 *Specification for laying Brockleband & Trainor pavement.*

All paving stones and other materials necessary to be removed shall be taken up and removed from the line of the street. The subsoil and other matter is then to be excavated and removed off the full width of the proposed pavement. Care must be taken in excavating to preserve the proper crown.

Upon this earth foundation is to be placed a layer of sand or gravel to a depth necessary to bring the top of the proposed new pavement to a proper grade, and so as to give an easy and smooth crown to the street.

On this foundation the Brocklebank & Trainor pavement is to be laid.

110 A compound flooring is first formed, consisting of an under or ground layer of sound pine boards, one inch thick, laid lengthwise with the line of the street, and are to be coated on both sides with a mixture of coal-tar and pitch, the ends resting on similar boards placed transversely from curb to curb. On this layer of boards are to be placed an upper layer of transverse planking or beveled joist one inch thick, one and three-fourths inches wide on the top, and beveled down so as to give one and one-fourth inches on the bottom.

Upon the foundation thus laid will be placed the pavement, which shall consist of white-pine blocks, free from rot or sap, having a thickness uniformly of three (3) inches, and a length of six (6) inches,

111 and a width of not less than six (6) inches, having a dovetailed rebate cut in the lower face of the blocks on both sides three-eight's of an inch at the top and beveled down to one-eighth of an inch at the bottom, so as to receive the transverse planking. The blocks for paving the gutter are to sawed to a uniform bevel so that a channel for surface water will be formed about six inches outside the curb line.

The blocks, before being set, are to be dipped in a mixture of coal-tar and pitch, and then to be set on end in a line at right angles with the line of the street, except at intersections. Care must be taken that the joints be broken, and also that all rot or sap be trimmed off.

The space between each row of blocks are now to be filled

112 with a mixture of coal-tar and pitch, thoroughly mixed and compactly rammed by means of pavers' rammers and an iron blade prepared to fit the joints, which blade during the process of ramming shall not be moved more than nine inches between the blows.

After the blocks have been thus set and thoroughly rammed between the rows, the entire surface of the roadway shall be slushed with a heated composition of coal-tar and pitch, and immediately covered with sound gravel and clean sand in equal proportions to a depth of three-quarters of one inch.

The work to be commenced by such time as may be designated by the street commissioner, and to be finished within the

113 of days bid for by the contractor; the contractor giving the street commissioner at least two days' notice before breaking ground.

Curb to be set or reset on each side of the street to the established grade, and all stones furnished shall not be less than three feet long, 4 inches thick, and 16 inches wide throughout, to be of the best quality North River blue stone, and be cut, prepared, and laid in the following manner: that is to say, the top of the stone shall be cut to a level of 1 inch, the front to be cut smooth and to a fair line the whole depth of the gutter, the ends from top to bottom to be truly squared so as to form close and even joints, the front so laid as to present a fair

114 and unbroken line; 8 inches of the curb shall be laid above the kennel and not less than 8 inches below it.

All curb, set or reset, to be filled and to be backed up with at least 6 inches of sand. Corners to be turned to the line in all intersecting streets when necessary. The present curb to be used in all cases when the same is unbroken.

Old materials.—All old materials, such as gutter-stones and cobble-stones, which it becomes necessary to remove, may be taken up and removed by the respective owners thereof, provided such removal is made in advance of the work of grading the street.

If said stones are not taken up and removed by the owners
115 within three days, after being notified by the inspector, they shall be considered as the property of the contractor, and the same shall be immediately removed by him from the line of the work.

A free, clear, and sufficient passage shall be left upon the sidewalk at all times after the same has been graded.

Clearing up.—As the street is graded and paved, the sidewalk graded, and the work completed, the contractor shall remove all refuse, stones, boulders, stumps, rubbish, or other materials, from the street, and leave all roads and places free, clear, and in good order, and until this is done and a certificate of the street commissioner of the effect that all
116 surplus materials have been removed from the line of the work, the same will not be considered as completed.

All materials furnished and all the work done which do not strictly conform to this specification or to the city ordinance shall be removed forthwith, and other materials and work done that shall be in accordance therewith; and in case of the neglect or refusal of the contractor or those employed by him to remove such materials, the street commissioner shall cause the same to be removed at the expense of the contractor, and to deduct the cost of such removal and all other expenses therein from the amount of the contract.

The right to construct any sewer or sewers, or receiving basins
117 and culverts, in said street, and grant permits for house connections therewith, at any time previous to the grading of the street for the laying of the pavement over the line of the same, is expressly reserved to the city council; and said contractor shall not interfere with or place any impediment in the way of any person or persons who may be engaged in the construction of such sewer, or in making any connection therewith, or in setting or resetting any curb or gutter stone on the line of the street, under the direction of the street commissioner or otherwise. The contractor will be required to readjust the manhole heads over the line of the sewer to conform to the level of the pavement before the pavement is laid down, at such price as may be agreed
118 upon with the engineer. He shall also provide for the flow of all drains or water-courses interrupted during the progress of the work at his own expense.

All loss or damage arising out of the nature of the work to be executed from accidents or from the action of the elements, or the injury or breaking up of gas and water-pipes, to be sustained by the contractor.

Inspector.—An inspector will be placed upon the work, and retained at the pleasure of the city council, until the same is fully completed; and should the work be prosecuted from more than one place at the same time, an inspector will be placed at each point to supervise the same; it being understood that the time bid in the proposals re-
119 fers to the aggregate time of all the inspectors who may be appointed on the work, and not to single consecutive days, it being further understood that the contractor shall be entitled to receive the sum of three dollars and fifty cents per day for each and every day that the aggregate time of all the inspectors may be less than the time specified in the bid for the completion of the work; and there shall be deducted from the final payment of such contractor, in addition to the penalties prescribed by the ordinances of the city, the sum paid for the inspector's wages for each and every day the aggregate time of all the inspectors employed upon said work may exceed the time stipulated in the bid for its completion.

120 Bidders will state the price per lineal foot for furnishing and setting curb, the price per square yard for the Brocklebank and Trainor pavement, and the price per square foot for furnishing and laying bridge-stones, also the time taken for the completion of the work, which will be tested at the rate of $3.50 per day. These prices are to cover the expense of regulating the curb on the whole line of the work, the expense of excavating or filling, also the furnishing of all the necessary materials and labor for the completion of all the work. Double price will be allowed for corners that are bid for curb. Bids containing more than is required to be bid for will be rejected as informal.

121 No certificate for payment will be given for a portion of the work done which is not accompanied by the inspector's certificate. The contractor shall be liable for keeping in good repair the whole of the work executed by him for a period of twelve months from the date of completion.

The quantities given are those that have been estimated approximately for the work. The city council do not hold themselves responsible for the same, and bidders are required to examine the plans and ground and judge for themselves.

122 Any omissions, alterations, or additions made by direction of the city authorities to the work during its progress are in no way to vitiate the contract, but the amount and value to be satisfactorily agreed upon in writing with the street commissioner or engineer before such work is done, otherwise no extra bills will be allowed. All extra bills must be presented and approved before the final estimate is given. In case of any alteration, detention, or suspension of the work, caused by the neglect or by the order of any officer of the corporation after the contract has been duly awarded, thereby causing a real or supposed loss to the contractor, the same must be reported to the city council at the first council meeting after date of such alteration, detention, or suspension, otherwise no allowance will be made therefor.

123 City surveyor's and inspector's certificates of work done must be presented at the street commissioner's office three days previous to the regular meeting of the city council. No certificates will be given for any one portion of the street unfinished.

Elizabeth.

Street Commissioner,
GEO. W. TUBBS.

Proposals for paving Grier avenue from the terminus of the Nicolson pavement to Bay Way with wood under the Brocklebank and Trainer patent, made this nineteenth day of September, 1870, by Geo. W. Tubbs, of Elizabeth, N. J.

124 1. I do declare that the New Jersey Wood-Paving Company are the only persons interested in this proposal, and that no other person than herein named has any interest in this proposal, or in the contract proposed to be taken.

2. I further declare that this proposal is made without any connection with any other person or persons making a proposal for the same work, and is in all respects fair and without collusion or fraud.

3. I refer to the estimate and specification as forming a part of this proposal issued by the street commissioner for proposals in relation to this contract, dated August 27th, 1870, and I will contract to furnish all the necessary material and labor, and perform the above-named

work in the manner and the conditions required by the specification above referred to, and upon the annexed terms, to wit:

	Amount.
For 3,300 square yards, at $4.50 per yard.....	$14,850 00
100 lineal feet of curb to be reset, at six (6) c'ts per foot.	6 00
50 do. feet of new curb, at 55 c'ts p'r foot.....	26 50
	$14,882 50
For 20 days' inspection, @ $3.50 per day.....	70 00
	$14,952 50

(On margin:) Awarded to Geo. W. Tubbs, Sept. 20, 1870.

I will further contract to commence the said work when directed, and finish the same by or before the expiration of the time bid for, unless said work is suspended by order of the city council, and to authorize the said council to deduct from the moneys which may grow due to me under the contract for the above work the sum specified in section 33 of an ordinance relating to streets and highways, the construction and repair of sidewalks and the public grounds of the city, passed April 27, 1863, for each and every day the same may be uncompleted after the time above stipulated shall have expired.

GEORGE W. TUBBS.

CITY OF ELIZABETH,
Union County, ss:

George W. Tubbs, being duly sworn, say' that the several matters stated in the annexed proposal are in all respects true.

GEORGE W. TUBBS.

Sworn and subscribed to this 19th day of Sept., 1870, before me.

SAMUEL S. MOORE,
Notary Public.

Known all men by these presents, that we, George W. Tubbs, Augustus C. Kellogg, and Samuel S. Moore, are indebted to the city of Elizabeth in the sum of five thousand dollars, lawful money of the United States, to be paid to the said The City of Elizabeth, its successors and assigns, to which payment well and truly to be made we bind ourselves, our and each of our heirs, executors, and administrators, jointly and severally, by these presents, sealed with our seals and dated this nineteenth day of August, eighteen hundred and seventy.

Whereas the said Geo. W. Tubbs has sent unto the city council of the city of Elizabeth a proposal to pave Grier avenue from the terminus of the Nicolson pavement to Bay Way for about the sum of fifteen thousand dollars in accordance with the ordinance of said city:

Now, the consideration of this obligation is such that if the said George W. Tubbs, on being awarded the said work, shall enter into a contract for the faithful performance of the same, according to the plans and specifications of said work, and shall perform the same in good and workmanlike manner, according to the terms of the said contract and specification, and satisfactorily to the city council, or such person or persons as they may appoint, or upon the failure or neglect of the said George W. Tubbs to enter into and execute said contract, if the said George W. Tubbs, Augustus C. Kellogg, and Samuel S. Moore, their

heirs, executors, or administrators, or either or any of them,
129 shall and do well and truly pay to the said The City of Elizabeth such sums of money as the said The City of Elizabeth shall pay to any person or persons, by whom the said work may be done, over and above the amount that the said George W. Tubbs would have been entitled to receive upon the completion thereof, under and according to the terms of said proposal, then this obligation to be void, else to be and remain in full force and virtue.

GEORGE W. TUBBS. [L. S.]
AUGUSTUS C. KELLOGG. [L. S.]
SAMMEL S. MOORE. [L. S.]

Sealed and delivered in the presence of—
AARON W. KELLOGG.

130 I do hereby certify the foregoing to be a true copy of the original exhibit in said cause on file in my office.

Witness my hand and official seal at Trenton, this sixteenth day of October, A. D. 1875.

[SEAL.] S. D. OLIPHANT,
Clerk.

(Endorsed:) Paving Grier avenue from the terminus of the Nicolson pavement to Bay Way. U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 6 on the part of complainants. May 2, 1872. W. J. Magie, M.

131 STREET DEPARTMENT,
Elizabeth, N. J., Nov. 16, 1870.

To the mayor and city council of the city of Elizabeth:

Certificate (No.) of final payment due on contract for paving North avenue, from the east line of Jefferson avenue to Broad street.

This is to certify that the contract for the above work was awarded to and executed by George W. Tubbs at the prices annexed, as per copy of the contract filed in my office, and that there has been completed under said contract the following amount of work, as per certificate No. of the surveyor, herewith furnished, to wit:

132 14,957 square yards of wood pavement at	4 50	67,306	50
800 feet of curb reset	06	48	00
85 feet of new curb	50	42	50
360 lineal feet of flagging relaid	15	54	00
196 square feet of bridge stone	90	176	40
22 square yards of trap-block, new	4 00	88	00
85 square yards of trap-block, relaid	75	63	75
88 feet of plank, 12 in. x 3 in	20	17	60
136 feet of culvert, 12 x 16, 2-inch plank	1 00	136	00
50 feet of culvert, 12 x 14, 3-inch plank	1 00	50	00
60 days	3 50	210	00

[SEAL.]

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Paving Company v. The City of Elizabeth et al. Exhibit No. 7 on the part of complainants. May 2, 1872. W. J. Magie, M. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

(Second indorsement:) Geo. W. Tubbs. Street-improvement fund. Certificate No. , for final payment due on contract for paving North ave., from Jefferson ave. to Broad street. Filed, Elizabeth, Nov. 16, 1870. J. Seiple, city clerk.

133 A true copy.
[SEAL.]

S. D. OLIPHANT,
Clerk.

STREET DEPARTMENT,
Elizabeth, N. J., May 24, 1870.

To the mayor and city council of the city of Elizabeth:

Certificate (No.) of final payment due on contract for paving Garden street, from Maple avenue to Washington avenue, with Brocklebank & Trainor pavement.

This is to certify that the contract for the above work was awarded to and executed by George W. Tubbs at the prices annexed as per copy of the contract filed in my office, and that there has been
134 completed under said contract the following amount of work, as per certificate No. of the surveyor, *w*erewith furnished, to wit:

6,498.8 square yards of pavement, at	4 50	29,244 60
150 feet of curb reset, at.....	05	7 50
35 days, at	2 75	96 25
		29,348 35
		88 00
		$29,260 35

And the above sum of twenty-nine thousand two hundred and sixty dollars and thirty-five cents, less previous payments, is certified to be "the amount due the contractor or his assigns for the work completed as aforesaid, according to the terms (as prices) of the contract."

L. J. HIGGINS,
Street Commissioner.

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Paving Company v. The City of Elizabeth et al. Exhibit No. 8 on the part of the complainants. May 2, 1872. W. J. Magie, M. Filed Nov. 18, 1872. S. D. Oliphant, clerk.

(Second indorsement:) George W. Tubbs. Street improvement fund. Certificate No. , for final payment due on contract for paving Garden street, from Maple avenue to Washington avenue, with Brocklebank and Trainor wood pavement. Filed, Elizabeth, June 6, 1870. J. Seiple, city clerk.

135 STREET DEPARTMENT,
Elizabeth, N. J., May 31, 1870.

To the mayor and city council of the city of Elizabeth:

Certificate (No.) of final payment due on contract for paving Grove street, from Maple avenue to Washington avenue.

This is to certify that the contract for the above work was awarded to and executed by George W. Tubbs at the prices annexed, as per copy of the contract filed in my office, and that there has been com-

pleted under said contract the following amount of work, as per certificate No. , of the surveyor, herewith furnished, to wit:

3,649.6	square yards of pavement, at $4.50	16,423	20
50	lineal feet of curb-stone reset, 10	5	00
136 4	lineal feet of new curb, 60	2	40
30	days, at 2.75	82	50
		16,513	10
		66	00
		16,447	10

And the above sum of sixteen thousand four hundred and forty-seven dollars and ten cents, less previous payments, is certified to be "the amount due the contractor or his assigns for the work completed as aforesaid, according to the terms (as prices) of the contract.

L. H. HIGGINS,
Street Commissioner.

A true copy.
[SEAL.] S. D. OLIPHANT, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Paving Company The City of Elizabeth et al. Exhibit No. 9, on the part of complainants. May 2, 1872. W. J. Magie, M. Filed Nov. 10, 1872. S. D. Oliphant, clerk.

(Second indorsement:) George W. Tubbs. Street improvement fund. Certificate, No. , for final payment due on contract for paving Grove street from Maple avenue to Washington avenue. Filed. Elizabeth, June 6, 1870. J. Seiple, city clerk.

137 *Complainant's Exhibit No.* 10.

STREET DEPARTMENT,
Elizabeth, N. J., Sept. 7, 1870.

To the mayor and city council of the city of Elizabeth:

Certificate (No.) of final payment due on contract for paving Newark avenue from Broad street to the city line.

This is to certify that the contract for the above work was awarded to and executed by George W. Tubbs at the prices annexed, as per copy of the contract filed in my office; and that there has been completed under said contract the following amount of work, as per final certificate No. , of the surveyor, herewith furnished, to wit:

138 25,809.7	cubic yards of excavation, at 25	6,452	42
10,043	lineal feet of curb, at 50	5,021	50
30,827.3	square yards of pavement, at $4.50	138,722	85
19¾	sets corners (177 f't), 1.00	177	00
612	square feet of bridge stone, at 1.25	756	00
47	square yards of trap-block (new), at 4.00	188	00
125	days, at 3.50	437	50
		151,764	27
Paid inspector		434	00
		151,330	27
Extra work on pavement		3,100	00
		152,630	27

And the above sum, one hundred and fifty-two thousand six hundred and thirty dollars and twenty-seven cents, less previous payments, is certified to be "the amount due the contractor, or his assigns, for the work completed as aforesaid, according to the terms (as prices) of the contract.

L. H. HIGGINS,
Street Commissioner.

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Paving Company v. The City of Elizabeth et al. Exhibit No. 10, on the part of complainants. May 2, 1872. W. J. Magie, M. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

(Second indorsement;) Geo. W. Tubbs. Street improvement fund. Certificate No. , for final payment due on contract for paving Newark avenue from Broad street to the city line. Filed. Elizabeth, Sept. 9, 1870. J. Seiple, city clerk.

139

STREET DEPARTMENT,
Elizabeth, N. J., November 1, 1870.

To the mayor and city council of the city of Elizabeth:

Certificate (No.) of final payment due on contract for regulating, grading, curbing, and paving Sherman avenue from Newark avenue to the city line.

This is to certify that the contract for the above work was awarded to and executed by George W. Tubbs, at the prices annexed, as per copy of the contract filed in my office; and that there has been completed under said contract the following amount of work, as per certificate No. of the surveyor, herewith furnished, to wit:

10,587 cubic yards of excavation, at	35		3,705 45
2,073.4 feet of curb,	55		1,140 37
5⅔ sets of corners (51 f't),	1 10		56 10
140 4,958.13 square yards of pavement,	4 50		22,312 35
30 days,	3 50		105 00
			27,319 27
			105 00
			$27,214 27

And the above sum of twenty-seven thousand two hundred and fourteen dollars and twenty-seven cents, less previous payments, is certified to be "the amount due the contractor, or his assigns, for the work completed as aforesaid, according to the (as prices) of the contract."

L. H. HIGGINS,
Street Commissioner.

Atrue copy.
[SEAL.]

S. D. OLIPHANT, *Clerk.*

(Indorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company The City of Elizabeth et al. Exhibit No. 11 on the part of complainants. May 2, 1872. W. J. Magie, M. Filed Nov. 10, 1873. , clerk.

(Second indorsement:) Geo. W. Tubbs. Street-improvement fund. Final certificate No. , for final payment due on contract for regulating, grading, and paving Sherman avenue from Newark avenue to the city line. Filed. Elizabeth, Nov. 30, 1870. J. Seiple, city clerk.

141 STREET DEPARTMENT,
Elizabeth, N. J., Nov. 23, 1870.

To the mayor and city council of the city of Elizabeth:

Certificate (No.) of final payment due on contract for paving Grier avenue from road (near Gohsings) to Bay Way.

This is to certify that the contract for the above work was awarded to and executed by George W. Tubbs, at the prices annexed, as per copy of the contract filed in my office; and that there has been completed under said contract the following amount of work, as per final certificate No. of the surveyor, herewith furnished, to wit:

3,449	square yards of pavement, at	$4 50	15,530 50
215	feet of curb reset, at	06	12 90
142 6	manhole-heads altered, at	3 50	21 00
20	days, at	3 50	70 00
			$15,554 40

And the above sum of fifteen thousand five hundred and fifty-four dollars and forty cents, less previous payments, is certified to be "the amount due the contractor, or his assigns, for the work completed as aforesaid, according to the terms (as prices) of the contract."

L. H. HIGGINS,
Street Commissioner.

A true copy.
[SEAL.] S. D. OLIPHANT, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Paving Company The City of Elizabeth et al. Exhibit No. 12 on the part of complainants. May 2, 1870. W. J. Magie, M. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

(Second indorsement:) Geo. W. Tubbs. Street-improvement fund. Certificate No. , for final payment due on contract for paving Grier avenue from road near Gohsings to Bay Way. Filed. Elizabeth, December, 1870. J. Seiple, city clerk.

143 No. 7261.] ELIZABETH, N. J. *Sept. 27th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of George W. Tubbs sixteen thousand seven hundred and seventy $\frac{00}{100}$ dollars. On account of street improvement. Paving Sherman avenue.

By order of the city council.
$16,770.00.

PH. H. GRIER, *Mayor.*

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 13 on the part of complainants. May 2, 1872. W. J. Magie, M. Credit New Jersey Wood Paving Co. G. W. Tubbs, per L. S. Moore. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk.*

144 No. 7167.] ELIZABETH, N. J., *Sept. 7th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of George

W. Tubbs three thousand one hundred $\frac{00}{100}$ dollars, on account of street improvement. Paving Newark avenue from Broad st. to city line.

By order of the city council.

$3,100.00.

PH. H. GREIR, *Mayor.*

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 14 on the part of the complainants. May 2, 1872. W. J. Magie, M. Credit the New Jersey Wood Paving Co. Geo. W. Tubbs, pe. S. S. Moore. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk.*

145 No. 7049.] ELIZABETH, N. J., *August 27th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs seventeen thousand two hundred and seventy $\frac{00}{100}$ dollars, on account of street improvement. Paving Newark avenue from Broad st. to city line.

By order of the city council.

$17,270.00.

PH. H. GREIR, *Mayor.*

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 15 on the part of the complainants. May 2, 1872. W. J. Magie, M. Credit New Jersey Wood Paving Co. G. W. Tubbs, p'r S. S. Moore. Filed Nov. 10, 1872. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk.*

146 No. 7711.] ELIZABETH, N. J., *Nov. 11th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs fourteen thousand four hundred and seventy $\frac{00}{100}$ dollars on account of street improvement. Paving North avenue from Jefferson avenue to Broad street.

By order of the city council.

$14,470.00.

PH. H. GREIR, *Mayor.*

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 16 on the part of the complainants. May 2, 1872. W. J. Magie, M. Credit New Jersey Wood Paving Co. Geo. W. Tubbs, p'r S. S. Moore. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk.*

147 No. 7474.] ELIZABETH, N. J., *October 8th*, 1872.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs fourteen thousand and four hundred $\frac{00}{100}$ dollars on account of

street improvement. Paving North avenue from Jeffe'son ave. to Broad street.

By order of the city council.

$14,400^{00}_{100}$.

PH. H. GREIR, *Mayor.*

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 17, on the part of the complainants. May 2, 1872. W. J. Magie, M. Credit N. J. W. P. Co. Geo. W. Tubbs, per S. S. Moore. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk.*

148 No. 6954.] ELIZABETH, N. J., *Aug. 13th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs eleven thousand four hundred and thirty $^{00}_{100}$ dollars on account of street improvement. Paving Newark avenue.

By order of the city council.

$11,430^{00}_{100}$.

PH. H. GREIR, *Mayor.*

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company vs. The City of Elizabeth et al. In equity. Exhibit No. 18, on the part of the complainants. May 2, 1872. W. J. Magie, M. Credit N. J. Wood Paving Co. Geo. W. Tubbs, p'r S. S. Moore. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk.*

149 No. 6922.] ELIZABETH, N. J., *August 6th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs eleven thousand one hundred and ninety $^{90}_{100}$ dollars on account of street improvement. Paving Newark avenue from Broad st. to city line.

By order of the city council.

$11,190^{90}_{100}$.

PH. H. GREIR, *Mayor.*

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 19, on the part of the complainants. May 2, 1872. W. J. Magie, M. Credit New Jersey Wood P. Co. Geo. W. Tubbs, per S. S. Moore. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk.*

150 No. 6778.] ELIZABETH, N. J., *July 22nd*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs nineteen thousand seven hundred and ten $^{00}_{100}$ dollars on ac-

count of street improvement. Paving Newark avenue from Broad street to city line.

By order of the city council.

$19,710\frac{00}{100}$.

PH. H. GREIR,
Mayor.

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company vs. The City of Elizabeth et al. In equity. Exhibit No. 20, on the part of the complainants. May 2, 1872. W. J. Magie, M. Credit New Jersey Wood Paving Co. Geo. W. Tubbs, p'r S. S. Moore. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT,
Clerk.

151 No. 6723.] ELIZABETH, N. J., *July 9th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs sixteen thousand two hundred and seventy $\frac{00}{100}$ dollars on account of street improvement. Paving Newark avenue from Broad st. to city line.

By order of the city council.

$16,270\frac{00}{100}$.

PH. H. GREIR,
Mayor.

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 21, on the part of the complainants. May 2, 1872. W. J. Magie, M. Credit New Jersey Wood Paving Co. G. W. Tubbs, p'r Moore. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT,
Clerk.

152 No. 6558.] ELIZABETH, N. J., *June 24th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs twenty-one thousand two hundred $\frac{00}{100}$ dollars on account of street improvement. Paving Newark ave. from Broad st. to city line.

By order of the city counsel.

$21,200\frac{00}{100}$.

PH. H. GRIER,
Mayor.

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 22, on the part of the complainant. May 2, 1872. W. J. Magie, M. Credit N. J. Wood Paving Co. G. W. Tubbs, per S. S. Moore. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT,
Clerk.

153 No. 6285.] ELIZABETH, N. J., *May 14th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs eleven thousand eight hundred and eighty $\frac{00}{100}$ dollars on account of street improvement. Paving Garden st. from Washington ave. to Maple ave.

By order of the city council.

$11,880\frac{00}{100}$.

PH. H. GRIER,
Mayor.

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 23, on the part of the complainants. May 2, 1872. W. J. Magie, M. Pay Cram Tubbs ab'e order. Geo. W. Tubbs. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT,
Clerk.

154 No. 6161.] ELIZABETH, N. J., *May 2nd*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs five thousand four hundred $\frac{00}{100}$ dollars, on account of street improvement. Paving Garden st. from Maple ave. to Washington ave.

By order of the city council.

$5,400\frac{00}{100}$.

PH. H. GREIR,
Mayor.

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 24 on the part of the complainants. May 2, 1872. W. J. Magie, M. Pay Crane, Tubbs & Co. on order. Geo. W. Tubbs. Crane, Tubbs & Co. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT,
Clerk.

155 No. 7965.] ELIZABETH, N. J., *Dec.* 7, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs five thousand three hundred & fifty-four $\frac{40}{100}$ dollars, on account of street improvement. Pave Greir ave.

By order of the city council.

$5,354\frac{40}{100}$.

PH. H. GRIER,
Mayor.

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 25 on the part of the complainants. May 2, 1872. W. J. Magie, M. Geo. W. Tubbs. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT,
Clerk.

156 No. 7196.] ELIZABETH, N. J., *Sept. 9th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs thirty-nine thousand two hundred and thirty-three $\frac{27}{100}$ dollars, on account of street improvement. Paving Newark avenue.

By order of the city council.

$39,233\frac{27}{100}$.

PH. H. GREIR,
Mayor.

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 26 on the part of the complainants. May 2, 1872. W. J. Magie, M. Geo. W. Tubbs. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT,
Clerk.

157 No. 6461.] ELIZABETH, N. J., *June 6th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs eleven thousand nine hundred and eighty $\frac{00}{100}$ dollars, on account of street improvement. Paving Garden street from Maple ave. to Washington ave.

By order of the city council.

$11,980\frac{00}{100}$.

PH. H. GREIR,
Mayor.

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 27 on the part of the complainants. May 2, 1872. W. J. Magie, M. Geo. W. Tubbs. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT,
Clerk.

158 No. 6460.] ELIZABETH, N. J., *June 6th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs eight thousand and seven $\frac{10}{100}$ dollars, on account of street improvement. Paving Grove street from Maple ave. to Washington ave.

By order of the city council.

$8,007\frac{10}{100}$.

PH. H. GRIER,
Mayor.

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 28 on the part of the complainants. May 2, 1872. W. J. Magie, M. Geo. W. Tubbs. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT,
Clerk.

159 No. 6485.] ELIZABETH, N. J., *June 9th*, 1875.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs thirteen thousand two hundred and thirty $\frac{00}{100}$ dollars, on account of street improvement. Grade, curb, and pave, Newark ave., from Broad street to city-line.

By order of the city council.

$13,230$\frac{00}{100}$.

PH. H. GREIR, *Mayor*.

J. SEIPLE, *Clerk*.

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 29 on the part of the complainants. May 2, 1872. W. J. Magie, M. Geo. W. Tubbs, per W. W. Crane. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk*.

160 No. 7705.] ELIZABETH, N. J., *Nov. 3rd*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs ten thousand and four hundred and forty-four $\frac{27}{100}$ dollars, on account of street improvement. Paving Sherman ave.

By order of the city council.

$10,444$\frac{27}{100}$.

PH. H. GREIR, *Mayor*.

J. SEIPLE, *Clerk*.

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 30 on the part of the complainants. May 2, 1872. J. W. Magie, M. Geo. W. Tubbs, per W'm W. Crane. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk*.

161 7764.] ELIZABETH, N. J., *Nov. 19th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs ten thousand and two hundred $\frac{00}{100}$ dollars, on account of street improvement. Paving Greir ave. from road near Goshing's to Bay Way.

By order of the city council.

$10,200$\frac{00}{100}$.

PH. H. GREIR, *Mayor*.

J. SEIPLE, *Clerk*.

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company vs. The City of Elizabeth et al. In equity. Exhibit No. 31, on the part of complainants. May 2, 1872. W. J. Magie, M. Geo. W. Tubbs, per W'm W. Crane. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk*.

162 No. 7756.] ELIZABETH, N. J., *Nov.* 18, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W.

Tubbs twenty-one thousand seven hundred and eighty-two $\frac{75}{100}$ dollars, on account of street improvement. Paving North ave.

By order of the city council.

$21,782$\frac{75}{100}$.

J. SEIPLE, *Clerk.*

PH. H. GREIR, *Mayor.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 32, on the part of the complainants. May 2, 1872. W. J. Magie, M. Geo. W. Tubbs, per W'm W. Crane. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk.*

163 No. 7571.] ELIZABETH, N. J., *October 22nd*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs seventeen thousand three hundred and thirty $\frac{00}{100}$ dollars, on account of street improvement. Paving North ave. from Broad st. to Jefferson ave.

By order of the city council.

$17,330$\frac{00}{100}$.

J. SEIPLE, *Clerk.*

PH. H. GRIER, *Mayor.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 33, on the part of complainant. May 2, 1872. W. J. Magie, M. Geo. W. Tubbs, per W'm W. Crane. Filed Nov. 10, 1873. S. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk.*

164 EXHIBITS.

No. 6337.]

ELIZABETH, N. J., *May 27th*, 1870.

Treasurer of the city of Elizabeth: Pay to the order of Geo. W. Tubbs, eight thousand four hundred and forty $\frac{00}{100}$ dollars, on account of street improvement. Paving Grove street, from Maple ave. to Washington ave.

By order of the city council.

$8,440$\frac{00}{100}$.

PH. H. GRIER, *Mayor.*

J. SEIPLE, *Clerk.*

(Endorsed:) U. S. circuit court, district of New Jersey. The American Nicolson Pavement Company v. The City of Elizabeth et al. In equity. Exhibit No. 34, on the part of complainants, May 2, 1872. W. S. Magie, M. Geo. W. Tubbs, per S. S. Moore. Filed Nov. 10, 1872. J. D. Oliphant, clerk.

A true copy.

S. D. OLIPHANT, *Clerk.*

165 *Complainant's Exhibit No. 1.—Willard, examiner.*

The U. S. Patent Office, to all persons to whom these presents shall come, greeting:

This is to certify that the annexed is a true copy from the records of this office of the letters patent granted David L. DeGolyer, dated April 6th, 1869, No. 88765, for imp't in laying wooden block pavement.

In testimony whereof I, Samuel A. Duncan, Acting Commissioner of Patent', have caused the seal of the Patent Office to be hereunto affixed this fourteenth day of January, in the year of our Lord one thousand eight hundred and seventy-one, and of the Independence of the United States the ninety-fifth.

SAMUEL A. DUNCAN,
Acting Commissioner.

166 No. 88765.

The United States of America, to all to whom these letters patent shall come:

Whereas David L. DeGolyer, of Chicago, Illinois, has alleged that he has invented a new and useful improvement in laying wooden block pavement, and has made oath that he is a citizen of the United States; that he verily believes he is the original and first inventor or discoverer of the said improvement, and that the same hath not, to his knowledge and belief, been previously known or used, has paid into the Treasury of the United States the sum of thirty-five dollars, and presented a petition to the Commissioner of Patents praying that a patent may be issued therefor. These are, therefore, to grant to the said David L. DeGolyer, his executors, administrators, or assigns, for the term of seventeen years from the six' day of April, one thousand eight hundred and sixty-nine, the full and conclusive right and liberty of making, using, and vending to others to be used the said improvement, a description whereof is given in the annexed schedule and made a part of these presents.

167 In testimony whereof I have caused these letters to be made patent and the seal of the Patent Office to be hereunto affixed.

Given under my hand at the city of Washington this sixth day of April, in the year of our Lord one thousand eight hundred and sixty-nine, and of the Independence of the United States of America the ninety-third.

[SEAL.]

W. T. OTTO,
Acting Secretary of the Interior.
ELISHA FOOT,
Commissioner of Patents.

Countersigned and sealed with the seal of the Patent Office.

[Here follows diagram.]

168 UNITED STATES PATENT OFFICE.

David L. DeGolyer, of Chicago, Illinois, letters patent No. 88765, dated April 6, 1869. Improvement in laying wooden block pavement.

The schedule referred to in the letters patent and making part of the same.

To all whom it may concern:

Be it known that I, David L. DeGolyer, of Chicago, in the county of

Cook and State of Illinois, have invented certain new and useful improvements in wooden block pavements for roadways, &c., and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompan'ing drawings making part of this specification, and to the letters of reference marked thereon, like letters indicating like parts wherever they occur.

To enable others skilled in the art to construct and use my invention, I will proceed to describe it:

My invention relates to wooden pavements for streets and roadways, and consists in a new method of so constructing and arranging rows of wooden blocks upon a continuous foundation laid directly upon
169 the road-bed as to form continuous channels across the roadway, by the use of an auxiliary strip extending to the foundation to determine both the parallelism of the rows of blocks and the width and depth of the channels, and in afterward removing this auxiliary strip and filling the space or channel occupied by it with gravel, broken stone, or other suitable material, and tar, as hereinafter described. In the drawings figure 1 is a top-plan view, and figure 2 is a cross-section on the line *x*–*x* of fig. 1.

The earth of the roadway upon which my wooden pavement is to be constructed must first be suitably prepared and graded. This may be done in any of the usual methods. When thus prepared, I first lay wooden sleepers, *c*, as shown in figure 2, transversely across the roadway. These sleepers *c*, I make of suitable size and place them at the required distances from each other to receive the ends of the boards A, which I lay longitudinally along the roadway, and so as to form a continuous foundation, as shown in fi'r's 1 and 2.

170 The board A, used for the foundation, should be of the same thickness, and of any kind or quality suitable for the purpose.

Upon this continuous foundation, thus constructed, I arrange rows of wooden blocks, B, so as to form continuous channels across the roadway, as shown in Fig. 1. In doing this, I first arrange one row, fixing it rigidly or firmly in position by any convenient means, and then placing next to this row of blocks the auxiliary strip E, as shown in Fig. 2, and then against it another row of blocks, as shown in the same figure. This auxiliary strip E, I make wide enough to extend to the foundation boa'ds A, and still be sufficiently far enough above the upper surface of the blocks for convenience in removing it. Its thickness should be made to correspond with the desired width of the channel. Its position causes the rows of blocks on each side of it to run parallel with each other, and when the second row is thus arranged, it can, in the process of being arranged, be fixed in position. After this is done, I remove the auxiliary strip E, which leaves a channel of the depth
171 of the blocks extending continuously across the roadway,

In like manner I construct and arrange another parallel row of blocks, with the aid of the auxiliary strip, and make another continuous channel across the roadway, and so on indefinitely. In the process of constructing and arranging the rows of blocks and the continuous channels, it is obvious that they may be made in whole or in part as the work progresses. These continuous channels, thus made, I fill with gravel, broken stone, or slate or other suitable materials, and then pour upon the filling hot tar in sufficient quantities to penetrate and entirely fill all the cavities or vacant spaces that may exist in and between the particles of the material used for filling, and then pack or ram the filling by means of an iron blade conforming with the width of the channels, driven down by a rammer.

The tar, before being used, I boil long enough so that it will become stiff, but not hard and brittle when cold. When the hot tar is poured upon the filling, the pavement is completed. The wooden blocks
172 used in the construction of my pavement are cut with parallel lines or surfaces, from joist or other suitable timber, in cross-sections of the shape shown in the drawings, and of any desired dimensions. These blocks are placed end upward upon the foundation, and as they are all cut of the size and with parallel sides when placed in lines, they form compact continuous rows, with intervening channels extending to the foundation. The simplicity of the construc' of my pavement enables laborers of ordinary skill to construct it easily and rapidly, and therefore cheaply. As there is nothing above the foundation but the rows of the blocks and the filling in the intervening channels, it forms a very compact and uniform body, and possesses all the qualities of durability and utility that can be given to any wooden-block pavement.

I am aware of the English patent granted to one Henry Austin, in the year 1843, and numbered 9737, and do not claim a wooden pavement constructed as therein described; but what I do claim as my invention, and desire to secure by letters patent, is the method herein described
173 of constructing a wooden pavement, consisting of wooden blocks set in rows, with spaces or channels between, filled with gravel, broken stone, or other suitable material, and tar, which method consists in the use of an auxiliary removable strip, or board, to determine the parallelism of the rows and the width of the channels, but forming no part of the completed pavement, substantially as herein described.

DAVID L. DE GOLYER.

Witnesses:
J. J. COOMBS.
H. B. MUNN.

174 *Complainant's Exhibit No. 8.—E. G. T.*

The U. S. Patent Office to all persons to whom these presents shall come, greeting:

This is to certify that the annexed is a true copy from the files of this office Complainant's Exhibit No. 8. E. G. T., S. E.

In testimony whereof I, M. D. Leggett, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this twenty-fourth day of March, in the year of our Lord one thousand eight hundred and seventy-one, and of the Independence of the United States the ninety-fifth.

[SEAL.]

Commissioner.

175 Before the Commissioner of Patents.

In the matter of application of George F. Bigelow, administrator of the estate of Samuel Nicolson, deceased, for extension of letters patent granted to him on the 8th day of August, 1854, for improved wooden pavement, as reissued August 20th, 1867.

Testimony taken before me, William H. Bishop, a notary public of the city & County of New York, on this 6th day of April, A. D. 1868, on the part and behalf of the above-named applicant.

JOHN W. BROCKLEBANK, a witness produced on behalf of the above

applicant, in answer to interrogatories propounded by Andrew J. Todd, esq., of counsel, testifies as follows:

176 1st int'y. What is your name, age, residence, and occupation?

Ans. John W. Brocklebank; age, 47; reside in New York City, and am in the lumber and grain trade.

2nd int'y. Are you acquainted with the improved wooden pavement for streets and highways described in the patent granted to Samuel Nicolson on the 8th day of August, 1854, and subsequently reissued, commonly known as the Nicolson pavement? If yea, please state the extent of your knowledge and familiarity with same, and how long you have practically known said Nicolson pavement.

Ans. I am acquainted with the Nicolson wooden pavement; have known of it for 5 years practically.

177 3rd int'y. Have you, from your pursuits, occupation, or examination, been familiar with the different forms of pavements for streets and highways generally used in the United States for the last twenty years or under? If you have, state the extent of your knowledge of such pavements.

Ans. I have for 25 years been practically acquainted with all the different forms of stone and iron pavements. Having laid plank roads, &c., I have been, and am at present, familiar with all the wooden pavements that have been or attempted to be introduced in the principal cities in the United States. I am particularly acquainted with the Nicolson pavement, having witnessed the laying of it and given it particular attention.

178 4th int'y. Do you consider the said Nicolson pavement of value to the public?

Ans. I do consider it of very great value to the public.

5th int'y. In what do the advantages consist?

Ans. I consider its advantages as follows: It gives the horse a firm foot-hold and enables him, being of a smooth and even surface, to perform double the amount of labor with less exertion, and when his day's work is done, especially the draught-horse, he is in better condition. As for our carriage-horses, the ease and speed with which they move along the streets is much greater than on any other known pavement, there being no danger of slipping, &c. It is a well-known fact that many of

179 our citizens owning valuable horses carefully avoid the various kinds of stone pavement now in use, there being constant danger of slipping, straining, or otherwise injuring the horses. And then the wear and tear of carriages and other vehicles is enormous, thereby depreciating both horses and vehicles and rendering them unfit for pleasure purposes; they are used in their broken-down and worn out condition by venders, &c.; hence the horse and vehicle driven over the Nicolson wooden pavement will last much longer and retain their good qualities, while the stone pavements will reduce them comparatively to utter worthlessness.

Again, in the city of New York, where at one time no respectable parties would think of driving for pleasure, we find, comparatively, a boulevard for all the finest turnouts in the city. This I know from

180 personal observation, and refer all whom it may concern for an example to Mercer street, New York City. This pavement diminishes the rates of insurance upon horses and other draught animals. It diminishes the cost of shoeing horses not less than 66⅔ per cent. It increases the ease and comfort of business generally, being noiseless and

free from gritty dust which arises from the action of the wearing of the wheel and the tread of the horse upon the stone pavement.

It greatly diminishes the cost of repairs to the streets. It prevents wholly the freezing of gas and water pipes. Being impervious to water, it prevents dampness and moisture from penetrating the basements and cellars of buildings along the streets where it is laid. And in a sanitary point of view it is more healthful than any other known pavement.

181 To invalids, the sick, and for business, it being free from noise, it is invaluable. It enhances the value of real-estate from 10 to 50 per cent. I consider the durability of said Nicolson pavement greater than that of any other from the fact that each block of wood has an equal foundation and its worth is at least 100 per cent. more than any other pavement now in use.

6th int'y. Considering all the advantages which you have alluded to, state what is your opinion in reference to the merit and value of said Nicolson wooden pavement, as compared to any other pavement now in use?

Ans. Considering all its merits and value, it is the best pavement that has ever been introduced to the public, and is worth at least 200 per cent. more; for instance, take our most valuable carriage-horses at a

182 valuation of from $500 to $5,000, that find their way into our cities, the owners of same are in constant fear of some accident happening them before they go far over our stone pavements, such as slipping, straining, or otherwise injuring themselves, thereby depreciating their value not less than 500 per cent.

7th int'y. State whether the said Nicolson pavement has gained in public favor as it has become more known, and whether the same is now superseding other kinds of paving, and to what extent?

Ans. It is gaining in favor of the entire public; universally liked where it is already introduced, and is rapidly superseding all other forms of pavement to such an extent, that where the Belgian pavement has been suggested parties objected to same even at the personal expense of those who proposed it (the Belgian pavement).

183 8th int'y. Having reference to all the benefits to the people of the United States to be derived from the use of the Nicolson pavement generally in its cities and villages, at what sum of money would you value the said invention in gross, taking into account the gain to the public from having the benefit of said invention?

Ans. If all the streets in the cities and villages in the United States were paved with the said Nicolson pavement, in seven years the public would be benefitted at least from six to seven hundred millions of dollars, giving an annual saving on horses, vehicles, pavement, insurance on live-stock, &c., of at least one hundred millions of dollars.

184 9th int'y. Are you in any manner interested in the result of this application for extension?

Ans. I am not interested.

JOHN W. BROCKLEBANK.

STATE OF NEW YORK,
City & County of New York, ss:

On this 6th day of April, 1868, before me personally appeared the within-named John W. Brocklebank, and made oath that the foregoing deposition by him subscribed contains the whole truth and nothing but the truth.

The said deposition is taken at the request of George F. Bigelow, administrator of the estate of Samuel Nicolson, deceased, to be used at

the hearing in the matter of the application for extension of let-
185 ters patent granted to Samuel Nicolson on the 8th day of August, 1854, for improved wooden pavement, a' reissued August 20th, 1867.

W. H. BISHOP,
Notary Public.

Ex., J. A. W.

(Indorsed:) 27. Deposition of John W. Brocklebank. June 2, 1868.

186 Before the Commissioner of Patents.

In the matter of the application of George F. Bigelow, administrator of the estate of Samuel Nicolson, deceased, for extension of letters patent granted to him on the 8th day of August, 1854, for improved wooden pavement as reissued August 20th, 1867.

Testimony taken before me, William H. Bishop, a notary public of the city & county of New York, on this 4th day of April, A. D. 1868, on the part of the above-named applicant:

CHARLES TRAINER, a witness produced on the part of the above-applicant, in answer to interrogatories propounded by Andrew J. Todd, esq., of counsel, testifies as follows:

187 1st int'y. What is your name, age, residence, and occupation?

Ans. Charles Trainer; age, 32; reside in Milwaukie, Wisconsin, and by occupation a contractor.

2nd int'y. Are you acquainted with the improved wooden pavement for streets and highways described in the patent granted to Samuel Nicolson on the 8th day of August, 1854, and subsequently reissued, commonly known as the Nicolson pavement? If yea, please state the extent of your knowledge and familiarity with same, and how long you have practically known said Nicolson wooden pavement.

Ans. I have known the Nicolson pavement since 1859. I laid 6,000 yards of same in Milwaukie in 1861; was engaged in laying it in Madison, Wisconsin in the years 1865 and 1866; laid 10,000 yards in
188 Oschkosh, Wisconsin, in the year 1866; laid 9,000 yards in Green Bay, Wisconsin, in the year 1867. I superint'ed laying it in Philadelphia and New York cities, 20,000 yards.

3rd int'y. Have you, from your pursuits, occupation, or examination, been familiar with the different forms of pavements for streets and highways generally used in the United States for the last twenty years or under? If you have, state the extent of your knowledge of such pavements.

Ans. I have been more or less familiar with and engaged in laying the said Nicolson pavement since 1861, and familiar with all other forms of pavements.

4th int'y. Do you consider the said pavement of value to the public?

189 Ans. I do consider it of immense value to the public.

5th int'y. In what do the advantages consist?

Ans. 1st. It enables horses to draw much heavier loads, by affording an even surface and a strong and sure foot-hold.

2nd. It diminishes the wear and tear of horses and vehicles to the extent of 40 per cent.

3rd. It diminishes the expense of shoeing horses not less than 50 per cent.

4th. While in itself it is a much cleaner pavement than any other, it

diminishes the cost of removing dirt from the street not less than 50 per cent.

5th. It very greatly increases the ease and comfort of business along the streets where it is laid, by diminishing noise and doing away with gritty dust caused by disintegration of stone and iron.

6th. It greatly diminishes the cost of keeping the streets in repair.

190 7th. Being perfectly water-tight, it prevents water from finding its way into basements under sidewalks.

8th. Possessing non-conducting qualities, it prevents wholly the freezing of gas and water pipes, and the soil, beneath the pavement.

9th. It facilitates the access to gas and water pipes.

10th. Being impervious entirely to water, it facilitates the drainage of streets and prevents the infilteration of water and vegetable matter, thereby preventing the exhalation of same and rendering the said Nicolson pavement more healthful than any other known pavement.

11th. Wherever it is laid it enhances the value of real estate on an average of not less than 20 to 25 per cent. I have known in some instances that completing parallel streets have been obliged to remove newly-laid stone pavements and substitute the Nicolson pavement in its stead, in order to compete in business with other streets having said Nicolson pavement.

12th. I consider the durability of this pavement, considering
191 the small amount of repairing which it needs, to be not less than 100 per cent. greater.

6th int'y. Considering all the advantages to which you have alluded, state what is your opinion in reference to the merit and value of said Nicolson pavement as compared with any other pavement now in use.

Ans. I consider the Nicolson pavement, all things considered, the best that has ever been introduced to the public, and worth at least 150 per cent. more than any other known pavement; while its cost does not exceed that of the well-known Belgian pavement, when it (the Belgian pavement) is properly laid.

7th int'y. State whether the said pavement has gained in the
192 favor of the public as it has become more known, and whether the same is now superseding other forms of paving; and, if yea, to what extent?

Ans. I am familiar with the estimate in which the pavement is held by the people of many cities, east and west, and I know that wherever the pavement has been laid it is rapidly gaining favor and greatly superseding all other forms or kinds of pavement. And I know that where they have had it the longest and have got the most of it the greater it is in demand.

8th. int'y. Having reference to all the benefits to the people of the United States to be derived from the use of the Nicolson pavement generally, in its cities and villages, at what sum of money would you value the said invention in gross, taking into account the gain to
193 the public from having the benefit of said invention?

Ans. Providing the Nicolson pavement were laid in every street in the United States, which is not otherwise paved, I believe the gross saving to the people in seven years would not be less than from $500,000,000 to $600,000,000.

9th int'y. Are you in any manner interested in the result of this application for extension?

Ans. I am in no way interested in the result of this application for extension.

CHA'S TRAINER.

194 STATE OF NEW YORK,
City and County of New York, ss:

On this 4th day of April, 1868, before me, personally appeared the within-named Charles Trainer and made oath that the foregoing deposition by him subscribed contains the whole truth, and nothing but the truth.

The said deposition is taken at the request of George F. Bigelow, administrator of the estate of Samuel Nicolson, deceased, to be used at the hearing in the matter of the application for extension of letters patent granted to Samuel Nicolson on the 8th day of August, 1854, for improved wooden pavement, as reissued August 20th, 1867.

W'M H. BISHOP,
Notary Public.

Ex. J. A. W.

195 (Indorsed:) 29. Deposition of Charles Trainer. June 2nd, 1868.

196 *Def'd'ts' Exhibit No. 7, E. G. T., S. E., Jan. 20th, '71.*

A. D. 1838. No. 7645.

WOOD PAVEMENTS.

Stead's specification.

To all to whom these presents shall come, I, David Stead, of Great Winchester street, in the city of London, merchant, send greeting:

Whereas her present most excellent Majesty Queen Victoria, by her letters patent under the great seal of Great Britain, bearing date at Westminster, the nineteenth day of May, in the first year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said David Stead, her especial license, full power, sole privilege and authority, that I, the said David Stead, my ex'ors, adm'ors and assigns, or such others as I, the said David Stead, my ex'ors, adm'ors, or assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the town of Berwick-upon-Tweed, the invention of "making or paving
197 public streets and highways, and public and private roads, courts, and bridges, with timber or wooden blocks," communicated to me by a certain foreigner residing abroad; in which said letters patent is contained a proviso, that I, the said David Stead, shall cause a particular description of the nature of the said invention and in what manner the same is to be performed, to be inrolled in her said Majesty's high court of c'ancery within six calender months next and immediately after the date of the said in part recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear:

Now know ye that, in compliance with the said proviso, I, the said David Stead, do hereby declare the nature of the said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being

had to the drawings hereunto annexed, and to the figures and letters marked thereon, that is to say:

The invention consists of a mode of paving by means of wooden blocks cut or formed of similiar sizes or dimensions; and, in order to give the best information in my power, I will proceed to describe the drawing annexed, which represents part of a road or other similar surface laid down with blocks of wood of a sexagonal figure, which figure
198 at once offers the advantage of going together, and also that the lines of junction proceed in varied directions, by which the blocks of wood will sustain each other more securely than if formed of any other figure.

I do not, however, confine my claims to sexagonal blocks, as triangular or square blocks placed diagonally may be used with advantage; and in order further to secure the blocks from sinking or getting displaced, I employ dowels or pins to each block, as is shown in the drawing, though I do not consider this requisite in all cases. The blocks of wood are to be placed on the earth or formed with the grain of the wood in a vertical position; and in applying such blocks as a paving, the surface of the road or other such way is to be prepared in as solid a condition as possible, and to the figure or intended slopes, and the blocks are successively to be applied, having sand or other fine filling, driving each block up to those against which it is to rest, having first introduced the dowels or pins, which I prefer to be of oak.

And it should be stated that the wood I make use of should be
199 of a hard and solid texture, such as oak, pine, beech, &c., and that the size of the blocks I prefer for public roads and streets, about seven to ten inches diameter at top, slightly diminishing to the base, and about nine to twelve inches in height. And I prefer that the wood employed should be first boiled in tar or saturated by other suitable material, acting as a preservative to the wood; and it will be found advantageous to fill up the interstices between the blocks of wood with melted pitch, or pitch and sand, or earth combined; though this is not essential, and I make no claim for such using of pitch and sand or earth.

In witness whereof I, the said David Stead, have hereunto set my hand and seal this nineteenth day of November, in the year of our Lord one thousand eight hundred and thirty-eight.

DAVID STEAD. [L. S.]

(Here follows diagram.)

And be it remembered, that on the nineteenth day of November, in the year of our Lord 1838, the aforesaid David Stead came before our said lady the Queen, in her chancery, and acknowledged the specification aforesaid, and all and everything therein contained and specified, in form above written, and also the specification aforesaid was stamped according to the tenor of the statute made for that purpose. Inrolled the nineteenth day of November, in the year of our Lord one thousand eight hundred and thirty-eight.

ADAM.

200 *Def't's Exhibit No. 8.—E. G. T., S. E., Jan'y 20, '71.*

A. D. 1838. No. 7863.

PAVING ROADS.

Browne's specification.

To all to whom these presents shall come, I, John Browne, of Great Castle street, Oxford street, in the county of Middlesex, esquire, send greeting:

Whereas her present Most Excellent Majesty Queen Victoria, by her letters patent, under the great seal of Great Britain, bearing date at Westminster, the eighth day of November, in the second year of her reign, did for herself, her heirs and successors, give and grant unto me, the said John Browne, her special licence, full power, sole privilege and authority, that I, the said John Browne, my ex'ors, adm'ors, and assigns, or such as I, the said John Browne, my ex'ors, adm'ors, and assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales,
201 and the town of Berwick-upon-Tweed, my invention of "improvements in paving roads and streets," in which said letters patent is contained a proviso that I, the said John Browne, shall cause a particular description of my said invention, and in what manner the same is to be performed, to be inrolled in Her Majesty's high court of chancery, within six calendar months next and immediately after the date of the said in part recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

Now know ye that, in compliance with the said proviso, I, the said John Browne, do hereby declare the nature of my said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon, that is to say:

My invention relates to a mode of paving with blocks of stone, or with blocks of wood, and giving security thereto by means of cast or wrought-iron frames, or frames of other suitable material, as hereafter explained.

Description of the drawing.—Figure 1 represents the plan of
202 the frame; and figure 2 a vertical section thereof; and figure 3 is part of the section of a road or way constructed or paved according to my invention. The frames are to be of cast or wrought-iron by preference, or indeed of any suitable material, and are to have suitable means for connecting them together, and in such manner that any pressure on one of the frames will be aided and carried by the connections of the frames one with another. *a a* are bars of angle-iron, the lower portion, *a*, being that portion which rests on and is carried by the previously prepared roadway, which should be brought to the proper figure or slopes on the surface, and well beaten down, in order to consolidate the surface; and the frames *a a'* should also be formed to the slope or curves of the road or way, when the same is not intended to be truly horizontal. *a'* is the angle or vertical portion of the bars *a*, between which the blocks of stone or of wood are placed; and I would recommend that in using blocks of stone, to lay them with gravel, lime, and other materials, as heretofore, taking care that the whole combined

mass carried by any one frame should bind well together, in order
203 that all parts may combine together to produce a strong surface, each stone resting on the parts *a* of the frame *a a'*, as is shewn in the drawing, and being well rammed with gravel and lime, or other suitable material, between the joints or interstices will support each other, and by this means produce a more solid and lasting roadway than any mode heretofore practiced.

And I would remark that, in paving by this means, stone or blocks of wood of less depth than heretofore used may be employed, by which, notwithstanding the cost of the iron frames, a roadway may be paved at very moderate cost when compared with the lasting properties thereof.

And I would further remark that, in paving with blocks of wood in combination with iron frames, I prefer that the grain should be vertical, and the same may be square or of any other figure parties may determine on; and it will not be necessary to have the joints filled with any material, but allow the surface to come together; at the same time, if it be wished, the joints or interstices between the blocks may be run with pitch or tar, and sand or any other material. *b b* are projections, and *c c* openings, by which the frames *a a'* go together, and aid to support each other.

204 Having thus described the nature of my invention, I would have it understood that I do not confine myself to any particular figure or shape of frame *a*, as the same may be varied, and such may be the case in respect to the section of the bar *a a'* employed, and the mode of combining one frame with another; but what I claim as my invention is, the combining using of frames *a a'*, and blocks of stone or wood, as above described.

In witness whereof I, the said John Browne, have hereunto set my hand and seal this sixth day of May, in the year of our Lord one thousand eight hundred and thirty-nine.

J. BROWNE. [L. S.]

And be it remembered that on the sixth day of May, in the year of our Lord 1839, the aforesaid John Browne came before our said lady the Queen, in her chancery, and acknowledged the specifications aforesaid, and all and everything therein contained and specified, in form above written, and also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

WINGFIELD.

Inrolled the eighth day of May, in the year of our Lord one thousand eight hundred and thirty-nine.

(Here follows diagram.)

205 *Def't's Ex. No.* 9.—*E. G. T., S. E., Jan'y* 20, '71.

A. D. 1839. No. 8026.

Railway and other carriages, wheels, &c. Parkin's specification, with disclaimer and memorandum of alteration.

Specification.

To all to whom these presents shall come, I, Thomas Parkin, of number 22 Bridge street, Blackfriars, in the city of London, engineer, send greeting:

Whereas her present most excellent Majesty Queen Victoria, by her letters patent under the great seal of Great Britain, bearing date at Westminster, the ninth day of April, in the second year of her reign, did for herself, her heirs and successors, give and grant unto me, the said Thomas Parkin, her especial license, full power, sole privilege, and authority, that I, the said Thomas Parkin, my ex'rs, adm'ors, and assigns, or such others as I, the said Thomas Parkin, my ex'ors, adm'ors, or assigns, should at any time agree with, and no others, from time to time, and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within
206 England, Wales, and the town of Berwick-upon-Tweed, my invention of "Improvements in railroad and other carriages, and in wheels for such carriages, and in roads and ways on which they are to travel;" in which said letters patent is contained a proviso that I, the said Thomas Parkin, should cause a particular description of the nature of my said invention, and in what manner the same is be performed, to be inrolled in her said Majesty's high court of chancery within six calendar months next and immediately after the date of the said in part recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear:

Now know ye that, in compliance with the said proviso, I, the said Thomas Parkin, do hereby declare that the nature of my said invention, and the manner in which the same is to be carried into effect, are set forth and explained in the following description thereof, reference being had to the drawings hereunto annexed, and to the figures, letters, and numbers thereon marked, in correspondence with the figures, letters, and numbers herein contained, that is to say:

207 Firstly. My improvements in railroad and other carriages consist in modifying the carriage, whether waggon or coach, and in combining with the modification an apparatus for lifting the horse or horses entirely off the ground, and suspending him or them from the carriage or carriage-frame while descending hills, and adding a break to one or two of the wheels to retard the velocity, whereby the carriage may be safely allowed to run down hill by its own gravity, at a speed considerably greater than the safety of the horses would otherwise permit, and yet that the carriage may be retarded or stopped at pleasure by means of the break; and further in combining with the carriage the means of causing the binder axletree to turn on a centre pin, instead of the fore axletree, as in common use for guiding the carriage, and in providing for the fixing of the axletree at right angles to the path of the carriage while running on railways.

Secondly. My improvements in the wheels of carriages to run exclusively on railroads consist in two peculiar modes of combining
208 wood and iron together, so as to obtain wheels of great strength, one mode presenting at the periphery a surface of wood to roll on the iron rails, and the other mode having the wood covered with a ring or tire of iron, by both of which modes the destructive effects of concussion are avoided and travelling rendered much more easy.

Thirdly. My improvement on the wheels of carriages for running on common roads consists in making the outer part of the felloe of two rings, composed of wood, bolted side by side through a rib projecting from the middle, and constituting a part of an inner felloe of iron.

Fourthly. My improvement upon the wheels of carriages to run alternately upon common roads and upon railways consists in combining a felloe or tire of iron, to run upon the common road, with a felloe composed of short blocks of wood having the grain nearly in the direction

of the radius, secured to the side of the iron felloe, the wooden felloe to run upon a railway placed on the common road, the iron felloe
209 being of larger diameter than the wooden felloe, for the purpose of forming a flanch to prevent the wheel running off the rail, and of keeping the wooden felloe clear of the ground when running on the common road.

Fifthly. My improvement on railroads consists in forming the rails of hard wood, placed with the end of the grain in a vertical or nearly vertical position, laid either in a bed of concrete, or of cement, or of gravel.

Sixthly. My improvements in railways on common roads consist in the laying down of tram-rails and edge-rails in the same continuous line along the common road, the tram-rails being generally laid at the crossings of streets or roads, and in front of buildings, and the edge-rails at other parts of the road, in combination with certain communicating inclined pieces for the wheels to pass smoothly from one kind of rail to the other, and in combination also with a mode of securing both sorts of rails down upon bearers of wood by nails driven through the iron and through the wood into continuous bearers of asphalte or other suitable cement, laid in trenches dug in the road, the points of the rails being made thicker or broader than the shanks, and driven in
210 while the cement is soft, so that the cement may collapse around the neck of the nail, and prevent its being drawn out; and,

Seventhly. My improvements in roads and ways consist, according to my first mode, of paving them with blocks of wood, having the grain inclined to the horizon in some angle varying from about forty-five degrees to about seventy degrees, the grain of all the blocks leaning in the same direction or towards the same point of the compass; and, according to my second mode, of paving with similar blocks as in my first mode, but the alternate rows of blocks leaning towards the opposite points of the compass, each pair of oppositely leaning blocks being sometimes held together by a dowell passing through the middles of both blocks; and, according to my third mode, in paving with planks or blocks of wood having the grain lying in any direction, in combination with nails thickly driven into their upper surfaces, the twofold object of the nails being to diminish wear, and afford hold for the horses' feet and prevent their slipping; and, according to my fourth mode, of paving with blocks or planks having the grain lying, standing, or
211 leaning in any direction, in combination with grooves cut in the sides of the blocks or planks, and in the placing of tongues or keys of any suitable material into each pair of meeting grooves, for the purpose of causing each block or plank reciprocally to support and be supported by the contiguous blocks or planks; and, according to my fifth mode, in paving with blocks or pieces of wood of any convenient figure, with the grain either vertical or inclined, cemented together by filling the interstices between the blocks with a mixture of sand, pulverized chalk, brickdust, or other earthy matter, united with pitch or other bituminous substances or suitable cement, which mixture will melt or soften by the application of heat, but remain firm at the highest summer temperature.

And in order to take up such blocks, or batches of block', for laying gas or water pipes, I provide a lever of iron, having a wooden handle; the iron end being made hot, is thrust down into the interstice to melt the cement and lift it out; several such levers being heated at one time may be used simultaneously or in rapid succession, so that a block or a batch of blocks may be quickly separated from those

surrounding. And I also provide a plough or coulter of copper or iron for the same purpose, kept hot by a fire made around it while it is drawn along the interstice. And, according to my sixth mode, in paving with blocks of wood of any figure upon a foundation of sand, ashes, or saw-dust, saturated with tar or bituminous substance, especially if boiled, laid upon the natural ground for the blocks to rest on. And, according to my seventh mode, in cutting furrows or grooves in any direction, a few inches apart across the upper surfaces of the blocks of wood used in paving, whether the grain be vertical or inclined to the horizon; but in the case of small blocks being used, the grooves or furrows are formed by chamfering off the outer edges of the upper surfaces of the blocks, which furrows and chamferings may be made deep and filled up with asphalte or other cement or gravel and sand, the object being in both cases to prevent the horses' feet slipping. And, according to my eighth mode, in laying down on the sides of streets concave plates of iron, screwed or nailed down upon longitudinal bearers of wood, sunk at a proper depth below the roadway.

And the manner in which I carry these my various improvements into effect is shown by the drawings hereunto annexed, which are to be taken to form a part of this my said specification, and by the explanation of the same, as hereinafter contained.

Description of the drawings.—Figure 1 represents the profile of a carriage, with the horse suspended from the apparatus placed at the front of the carriage. Figure 2, plan of part of figure 1, with the body of the carriage and the horses omitted, in order to shew the frame-work apparatus under and in front of the carriage more distinctly. Figure 3, front elevation of figure 1, with the horses omitted, to shew the apparatus more distinctly. The carriage, as represented in these three figures, is designed for being run on common roads, but I make a modification for exclusive use on such railroads as are unconnected with common roads, by fixing each pair of wheels upon one common revolving axle in the ordinary manner, and placing flanches on the inner sides of the wheels to keep them from running off the rails, and I also remove the connecting rods and fit the hinder axle parallel to the fore axle.

The letters and numbers of reference signify the same parts in all the three figures, 1, 2, and 3. *a* represents the fore wheels of the carriage, which are placed far forwards in order that the weight of the carriage may have good leverage power for lifting the horses; *b*, the axle-tree of the front wheels; *c*, the hinder wheels; *d*, the axle-tree of the hinder wheel—this axle-tree turns on a centre-pin under a cross-bar, upon which the springs of the carriage are bolted; *e*, the hinder cross-bar of the carriage-frame, under which the axle-tree; *d* turns *f*, the centre-pin fixed in the cross-bar, *e g*, two iron rods holding the cross-bar *e* and fore axle *b* parallel to each other; *h*, two iron rods for the further bracing of the bar *e* and front axle-tree together; *k*, four springs for supporting the carriage-body; *l*, the carriage-body; *m*, the seat for the driver; *n*, an upright frame of wood affixed upon the front axle-tree; *p*, two iron diagonal braces to strengthen the frame *n*; *q*, two iron rods to support the top of the frame *n* from the cross-bar *e*; *r*, an horizontal frame projecting forwards from about the middle of the height of the upright frame *p*; *s*, two iron diagonal braces for strengthening the frame *r*; *s'*, two iron rods for keeping the outer ends of the frame *r* at proper distances; *t*, three braces of wood for supporting the front end of the horizontal frame *r* from the axle-tree *b*; *u*, three strong iron bearing-bars secured to the upper end of the upright frame *n* and to the front end of

the horizontal frame *r*; *v*, a shaft lying across and revolving on the middle parts of the three bearing-bars *u*; *w*, a toothed wheel fixed on the end of the shaft *v*; *x*, a worm working in and driving the toothed wheel *w*; *y*, a spindle and winch for turning the worm *x*; *z*, a shaft lying across and revolving on the front parts of the three bearing-bars *u*; 1, four pullies (fixed on the shaft *v*) to which eight ropes are fastened—four of which ropes hang down perpendicularly from the front sides of the pullies; 2, four pullies on the shaft *z*, over which pullies four of the ropes of the pullies 1 pass and hang down perpendicularly from the front sides of those front pullies; 3, two broad belts, each secured by the four
216 corners to two of the ropes hanging down from the pullies 1, and to two of the ropes hanging down from the front pullies 2, each of these belts being designed to support a horse; 4, two connecting-rods for turning the hinder axle-tree; 5, two arms jointed with and acting on the connecting-rods 4; 6, an upright spindle carrying the two arms 5 and turning in bearings affixed to the upright frame *p* and on the axle-tree *b*; 7, a lever or handle affixed on the upper end of the spindle 6 for turning the spindle, and thereby the arms, and by means of the connecting-rods turning the hinder axle-tree, and its wheels, to guide the carriage—this handle may, by means of a spring-catch of any ordinary construction, be held in such position as shall keep the hinder axle-tree parallel to the fore axle-tree when running upon railways; 8, a break and bent lever turning on a stud in the upright frame *p* and acting against the back of the fore wheel of the carriage, the handle of the lever reaching up near to the seat of the driver. Figure 4 shows an outside view of a compound railway-wheel. Figure 5, an inside view of the
217 same, or that side of the wheel which is next to the carriage. Figure 6, a transverse section of the wheel through the axis.

The same letters and numbers of reference signify the same parts in figures from 4 to 13, both inclusive; *a*, twelve sectors of wood, extending when first put together from the centre to the circumference of the wheel, the direction of the grain running from the circumference towards the centre; *b*, a circular plate and boss of cast iron, bolted on to the outside of the wheel; *c*, a circular plate and boss also of cast iron, bolted on to the inside of the wheel, the bolts passing through both plates, and through all the sectors, the plates being brought closely to embrace the wood by means of nuts at the outside of the wheel; *d*, the bolts; *e*, the nuts; one of the nuts is shewn in two views of a large size at Figure A, where it will be seen that the under corners of the nut are chamfered off. When the nut is tightened up to the requisite degree, I bind around the nut a piece of annealed wire and draw it tightly in under the four corners of the nut and twist the two ends of the
218 wire together, by which means the nut will not be liable to be shaken loose in the working of the wheel; this mode of holding the nuts from being shaken loose applies to the nuts of all the wheels hereinafter described. The nave may be made all of iron by casting a central hollow cylinder, projecting from the inside of one boss and fitting tightly into a bored aperture in the middle of the opposite boss; *f*, twelve plates of iron screwed on over the sectors on the inside of the wheel to give further support to the outer ring in addition to the bolts; *g*, the screws for screwing the plates *f*; *h*, a ring of cast-iron forming the flanch, to keep from running off the rails. This ring is kept concentric with the bosses by means of the plates *f*, as well as by the bolts of the ring; *k*, a ring of iron opposite the ring *h*, the two rings being firmly bolted together upon the wood near the circumference of the wheel; *l*, the bolts; *m*, the nuts; *n*, a slot for a key to fasten the wheel

on to the axle. When all the nuts are tightly turned on and screwed by binding wire, the wheel is affixed to a face-plate in the lathe where the centre hole is bored out, iron and wood together, and the periphery of the wood part turned truly, and thus the wheel is finished ready to be fixed on to the axle. Although the plate *b*, and the ring *k*, are shewn as lying upon the wood on the outside of the wheel, yet they may be wholly or in part let into the wood, and lie in recesses turned in the wood for their reception.

Figure 7, outside view of a railway-wheel, having an outer hoop or tire of iron with a flanch projecting from it, the main body and spokes of the wheel being made of iron and wood combined.

Figure 8, transverse section of the same, through the axis and through the middle of a spoke; *p*, two castings of iron forming the principal part of the two sides of the wheel, each casting consisting of a boss of eight broad arms or spokes, and of a ring chamfered or bevelled at the circumference, all cast together in one piece; the boss is bored out and the bevelled circumference of the ring turned in the lathe. *q*, a cylindrical piece of wood bolted in between the bosses; *v*, eight pieces of wood, two of them visible in the section, filling up the spaces between the arms and extending from the pipe *q* to the commencement of the bevel of the iron ring; these pieces of wood are respectively compressed by bolts and nuts between the two iron arms. *s*, a double ring of wood fitted in segments around the cast-iron ring and within a hoop forming the periphery of the wheel; *t*, the hoop or tire; *u*, the flanch to keep the wheel from running off the rails; *v*, an inner rib to keep the hoop or tire from slipping off from the double ring of wood, *s*. In order to form the double ring *s*, I first fix the segments of one half of the width of the ring dowelled or tongued together against a face-plate in the lathe, and turn the outside of the wood to fit within half of the width of the hoop or tire, *t*, turning also a rebate to receive the half of the thickness of the rib, *v*, and I turn the inner side of the wood to fit the outer and bevelled circumference of one of the castings, *p*; I then remove this half ring of wood from the face-plate, and affix the other half ring of segments and turn them into the same figure and size as the first half ring.

In proceeding to put the wheel together, I first lay one of the castings, *p*, on a level support, with the outside downwards, and lay one-half of the ring of wood *s* around and against the bevelled circumference of the casting, and then lay the eight pieces of wood upon the arms or spokes, and the cylindrical piece of wood *q* on upon the boss; I then heat the iron hoop or tire *t*, and place it outside around the half ring of wood. I next lay the other half ring of wood upon the first half ring within the hoop, and the other casting *p* upon the wooden spokes and upon the cylindrical piece of wood, and quickly pass the bolts through the arms and the bosses, and put on the nuts, turning them as tightly as possible before the hoop has time to lose much of its heat; the hoop will then shrink on and tightly embrace the double wooden ring *s*, and there will be no risk of its becoming loose if care be taken to form the ring *s* of dry, of boiled, or of steamed wood.

Figure 9, view of a wheel for running upon common roads.

Figure 10, transverse section of the rim and nave through the axis, with a view of two of the spokes; *w*, the nave of iron cast on upon the broad ends of the spokes *x*, the arms or spokes of sheet-iron about an eighth of an inch thick, the broad ends cast into the nave and the narrow ends into the felloe; *y*, the felloe of iron cast on upon the extremities of the spokes, having a rebate on each side of a middle rib

for the reception of the two halves of the wooden felloe; *z*, the wooden felloe bolted in two thicknesses to each other through the rib of the felloe *y*; two light rings of iron may be put on the wood under the bolt-heads and nuts, or they may be let into the wood, if desired, to afford greater security to the blocks.

Figure 11, view of the inside of a wheel for running alternately upon common roads and upon railways.

Figure 12, view of the outside of the same wheel.

Figure 13, transverse section of the same through the axis: 1, the felloe of iron cast on upon the extremities of the spokes, as described in the last-mentioned wheel; 2, the wooden felloe bolted on to the side of
223 the iron felloe; 3, recesses in the iron felloe to lighten the wheel.

Figure 14, elevation of a piece of railway made of wood.

Figure 15, transverse section of the same.

Figure 15½, plan of the same. The letters of reference signify the same parts in Figure 14 to 20, both inclusive; *a*, pieces of hard wood having the grain vertical or nearly vertical; *b*, cheeks formed of planks of wood with the grain horizontal, bolted on against the two sides of the pieces *a*.

Figure 16, longitudinal and vertical section of a tram-rail and of an edge-rail meeting together and leading one into the other.

Figure 17, plan of the same.

Figure 18, transverse section from B to C.

Figure 19, transverse section from D to E.

Figure 20, transverse section from F to G; *c*, the tram-rail; *d*, the edge-rail; *e*, an inclined piece leading from the side of the tram-rail on to the edge-rail; *f*, bearers of wood under the two kinds of rails; *g*, bearers of asphalte or other cement laid in a trench dug in the common road, the asphalte bearers supporting the iron; *h*, nails driven
224 through the iron rails and wooden bearers into the asphalte bearers; *k*, oblong holes in the rails to allow room for driving a second nail in case the first should not hold firmly or could not be readily drawn out. Should it be required to drive a nail into the asphalte after the asphalte is cold, the nail must be heated and driven while hot.

Figure 21 represents a view of a row of blocks of wood cut with the grain inclining to the horizon.

Figure 22, two blocks inclined in a similar manner.

Figure 23, elevation of a pair of blocks leaning in opposite directions and dowelled together.

Figure 24, plan of the same.

Figure 25, plan of a plank thickly studded with nails.

Figure 26, transverse section of two such planks tongued together.

Figure 27, view of a row of blocks stretching across a street and appearing rectangular, the leaning being towards the length of the street.

Figure 28, a pair of upright blocks in combination with grooves for the reception of tongues or keys between them and the contiguous blocks; *l*, see figures 21, 22, 26, 27, and 28, represent grooves for the reception of tongues or keys; *m*, see figures 22, 25, 26, and 27, represents
225 tongues or keys laid in some of the grooves; *n*, see figures 21, 22, and 29, shews grooves or notches in the upper surface of the blocks; *p*, similar grooves formed by chamfering off the edges of the blocks; *q*, see figure 21, grooves filled with asphalte; *r*, see figure 27, concave gutter-plates nailed down upon wooden bearers; *s*, the wooden bearers; *t*, curb-stones; *w*, flag-stones.

Figure 29 shews a batch of square blocks cemented together, which may be separated, singly or in masses, and taken up by melting the surrounding cement.

Figure 30 shews a batch of blocks of various sizes and figures cemented together within a square space, which batch may be removed in a mass when the cement is melted away from the surrounding straight grooves.

Figure 31, a lever of iron with handle of wood, the iron end to be heated for melting and lifting the cement out of the spaces between the blocks.

Figure 32, plan of a truck carrying a fireplace to give a continued heat to a coulter for ploughing out the cement.

Figure 33, longitudinal section of the same; *w* the coulter, made
226 of copper, as transmitting heat more freely than iron, and is not so soon burnt out; *p*, two braces to keep the coulter firmly in its position in the midst of the fire; *q*, a row of blocks, from part of which the cement is supposed to be melted away by the passage of the hot coulter. The parts of the truck are too obvious to need referring to.

And I hereby further declare, in reference to my improvements in railroad and other carriages, a' hereinbefore stated under my first head, that I am aware that the lifting of a portion of the weight of a horse, to ease his labor in descending hills, has often heretofore been effected in carts by shifting the body of the cart backwards on the axletree, and in other cases by taking a part of the loading from the front and placing it at the back of the cart. And I am aware, also, that a method of lifting a portion of the weight of a horse for the purpose of enabling him to increase his speed by striking the ground with his feet without pressing much of his weight on them, has already been made public. I therefore disclaim the partial lifting of a horse either on level
227 roads or on declivities. But I claim the right of elevating the horse entirely off the ground on declivities down which the carriage can run by its own weight, this elevation of the horse being combined with a break to regulate the speed of the descent, or to stop the progress of the vehicle at any part of the declivity, and in combination also with the turning of the hinder axletree of the carriage to make it go in a curvilinear direction, as above particularly described. And I claim the placing of the axletree and fore-wheels forwards near or beyond the front of the carriage in this combination, by which the weight of the carriage is thrown so far behind the horses as to more than counterbalance them when suspended.

And in reference to my second head of improvements, namely, in the wheels of carriages to run on railroads, I am aware of the plan for driving short blocks of wood endwise into a dovetailed groove in the periphery of an iron wheel; and I am aware, also, of an improvement upon this last-mentioned wheel, whereby similar short blocks of
228 wood are described as being held around the periphery of a wheel by a ring screwed on against the sides of the blocks, so as to hold them against the opposite flanch by compression. And I am further aware of a plan according to which it is proposed to secure a number of short blocks by holding them in a rebate formed in the periphery of the wheels. I therefore disclaim all these plans, together with all methods of securing short blocks to form the outer running surface or peripheries of wheels for being used exclusively on railways. But I claim the right of making railway wheels with pieces of wood extending from the nave or axle to the periphery, the wood being secured together by bolts between cheeks or plates and rings on each side, two examples of which construction are shown at Figures 4, 5, and 6, and at 7 and 8. And I claim the right of bolting or screwing on a ring to form the flanch in

any kind of railway wheel, so that the flanch may be replaced by a new one when it is worn out before the rest of the wheel.

And in regard to my third head, or my improvement upon the
229 wheels of carriages, to run on carriage roads,-I claim the right of constructing the outer part of the felloes of two rings composed of short pieces of wood, having the end of the grain standing against the circumference, and bolted to and through a middle rib projecting all around from and constituting part of the inner felloe of iron. And in regard to my fourth head, namely, the improvement upon the wheels of carriages to run alternately upon common roads and upon railways, I claim the right of combining a rim or tire of iron to run upon a common road with a tire of wood having the grain lying nearly in the direction of the radius, bolted on in short pieces by the side of the iron rim, the external part of the wood which is to run upon the railway being of less diameter than the iron rim which is to run upon the common road.

And in reference to my fifth head, respecting my improvement in railroads, I claim the formation of the rails of hard wood placed upon the end of the grain in or nearly in a vertical position, and of
230 laying the same in a bed of concrete of cement or of gravel.

And in respect of my sixth head, namely, improvements in railways on common roads, I claim the using of tram rails in cases where carriages are allowed to cross the road and in front of buildings, leading on to edge rails in other parts of the road; and I claim the leading pieces forming the communication between the tram rails and the edge rails; and I claim the nailing down of iron rails through wooden bearers upon bearers of cement or asphalte, with nails having thick points and comparatively thin shanks.

And in regard of my seventh head, or of improvements in railways, and whereas I claim, as my first and second modes, the paving with blocks of wood having the grain inclined to the horizon from about 45° to about 70°, and I claim the dowelling of the blocks together in pairs when slanting or leaning in opposite directions.

And in reference to my third mode, I claim the right of paving with wood having the grain vertical, horizontal, or inclined, in com-
231 bination with a great number of nails driven into the upper surface to diminish the wear and afford a hold for the horse's feet.

And in regard to my fourth mode of paving, I claim the right of making grooves in the sides of blocks and planks, and of placing tongues or keys of any suitable material into the pairs of meeting grooves, for preventing either of two contiguous blocks or planks held by one common tongue from sinking below or rising above the other.

And according to my fifth mode of paving, I claim the right of cementing blocks or pieces of wood together by filling up the interstices between them with a mixture of earthy matter, united with pitch, or other bituminous substance or suitable cement, which will melt with heat and yet remain firm at the highest summer temperature. And I claim the right of using a hot iron lever and a hot iron or copper plough or coulter, attached to a truck, to melt the cement, and of the interstices
232 between the blocks when it is required to take them up for the laying or repairing of water and gas pipes.

And according to my sixth mode of paving, I claim the right of laying upon the natural ground or foundation of the road a layer of sand, ashes, or sawdust, saturated with tar or other bituminous substance, especially if boiled, for the blocks to rest upon.

And according to my seventh mode, I claim the right of making

grooves or furrows in the upper surfaces of wooden pavement, whether the grain be placed in an inclined or in a vertical position.

And finally, according to my eight' mode, I claim the right of laying down concave iron plates upon longitudinal bearers of wood, for forming the gutters of streets, in combination with any kind of pavement; such several parts of my said invention and improvements so as aforesaid claimed by me being, to the best of my knowledge, new and not heretofore publicly used; and this specification and description being a full compliance with the proviso in the said letters patent con-
233 tained, I claim exclusive benefit and privilege of these my said invention and improvements.

In witness whereof I, the said Thomas Parkin, have hereunto set my hand and seal this seventh day of October, in the year of our Lord one thousand eight hundred and thirty-nine.

THO'S PARKIN. [L. S.]

And be it remembered, that on the seventh day of October, in the year of our Lord 1839, the aforesaid Thomas Parkin, esquire, came before our said lady the Queen in her chancery, and acknowledged the specifications aforesaid, and all and everything therein contained and specified in form above written. And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

Inrolled the ninth day of October, in the year of our Lord one thousand eight hundred and thirty-nine.

DUCKWORTH.

234 *Disclaimer.*

In the matter of a patent granted to Thomas Parkin, of Moorgate street, in the city of London, engineer, for the sole making, using, exercising, and vending of his invention of "improvements in railroad and other carriages, in wheels for such carriages, and on roads and ways on which they are to travel," within England and Wales and the town of Berwick-on-Tweed, bearing date at Westminster the ninth day of April, one thousand eight hundred and thirty-nine, to which the said Thomas Parkin did duly enrol' a specification.

Disclaimer to be entered by the said Thomas Parkin, pursuant to an act passed in the fifth and sixth years of the reign of His late Majesty King William the Fourth, entitled "An act to amend the laws touching letters patent for inventions."

Whereas I, the said Thomas Parkin, in the said specification,
235 described my invention so far as relates to improvements in railroads and other carriages, in manner following, that is to say:

Firstly. My improvements in railroad and other carriages consist in modifying the carriage, whether wagon or coach, and in combining with the modification an ap'aratus for lifting the horse or horses entirely off the ground and suspending him or them from the carriage or carriage-frame while descending hills, and adding a break to one or two of the wheels to retard the velocity, whereby the carriage may be safely allowed to run down hill by its own gravity at a speed considerably greater than the safety of the horses would otherwise permit, and yet that the carriage may be retarded or stopped at pleasure by means of the brake.

And, further, in combining with the carriage the means of causing
236 the *the* hinder axletree to turn on a centre-pin instead of the fore-axle, as in common use for guiding the carriage, and in providing

for the fixing of the axletree at right angles to the path of the carriage while running on railways.

And whereas I, in my said specification, also described my improvements in railways on common roads to consist in the laying down of tram rails and edge rails in the same continuous line along the common road, amongst other things, in combination with a mode of securing both sorts of rails down upon bearers of wood, by nails driven through the wood, with continuous bearers of asphalte or other suitable cement laid in trenches dug in the road, the points of the nails being made in manner in the said specification mentioned, and being driven in whilst the cement is soft, for the purpose therein also mentioned.

237 And whereas I, in my said specification, also described my improvements in roads and ways to consist, according to my third mode, "in paving with planks or blocks of wood, having the grain lying in any direction, in combination with nails thickly driven into their upper surfaces, the twofold object of the nails being to diminish wear and afford hold for the horses' feet and prevent their slipping;" and according to my fourth mode, "in paving with blocks or planks having the grain lying, standing, or leaning in any direction, in combination with grooves cut as therein mentioned, and in the placing of tongues or keys of any suitable material into each pair of meeting grooves, for the purpose therein mentioned;" and, according to my fifth mode, "in paving with blocks or pieces of wood cemented together, as therein

238 described;" and I, by my said specification, stated that in order to take up such blocks or batches of blocks for laying gas or water pipes, I provide a lever of iron having a wooden handle; the iron end, being hot, is thrust down into the interstices to melt the cement and lift it out; several such levers being heated at one time may be simultaneously or in rapid succession, so that a block or batch of blocks may be quickly separated from those surrounding, and I also provide a plough or coulter of copper or iron for the same purpose, kept hot by a fire made around it, while it is drawn along the interstices. And whereas I describe in my seventh and eighth modes of improvement in roads and ways, to consist, "according to my seventh mode, in cutting furrows or grooves in any direction, a few inches apart, across the upper surfaces of the blocks of wood used in paving, whether the grain be ver-

239 tical or inclined to the horizon, but in case of small blocks being used the grooves or furrows are formed by chamfering off the outer edges of the upper surfaces of the blocks, which furrows and chamferings may be made deep, and filled up with asphalte or other cement or gravel or sand, the object being, in both cases, to prevent the horses' feet slipping. And, according to my eighth mode, "in laying down on the sides of streets concave plates of iron, screwed or nailed down upon longitudinal bearers of wood, sunk at a proper depth below the roadway."

And whereas I, by my said specification, in reference to my improvements in railroad and other carriages, claimed the right of lifting the horse entirely off the ground on declivities down which the carriage can run by its own weight, this elevation of the horse being combined with a break to regulate the speed of the descent, or to stop the progress of the vehicle at any part of the declivity; and in combination also with the turning of the hinder axletree of the carriage, to make it go in a curvilinear direction, as above particularly described, and the placing of the axletree and *for* wheels forwards, or beyond the

240 front of the carriage in this combination, by which the weight of the carriage is thrown so far behind the horses as to more than counterbalance them when suspended.

And whereas by my said specification in reference to my improvement in railways in common roads, I claimed the nailing down of iron rails through wooden bearers upon bearers of cement or asphalte, with nails formed as therein mentioned; and whereas I also, in reference to my third mode, claimed the right of paving with wood, having the grain vertical, horizontal, or inclined in combination with a great number of nails driven into the upper surface to diminish the wear and afford a hold for the horses' feet; and in reference to my fourth mode, the right of making grooves cut in the sides of blocks and planks, and of placing tongues or keys of any suitable material into the pairs of meeting grooves for preventing either of two contiguous blocks or planks held by one common tongue from sinking below or rising above the other; and in reference to my fifth mode of paving, I, amongst other things, claimed the right of using a hot iron lever, and a hot iron
241 or copper plough or coulter attached to a trunk, to melt the cement out of the interstices between the blocks, when it is required to take them up for the laying or repairing the gas or water pipes; and according to my seventh mode of paving, I claim the right of making grooves or furrows in the upper surfaces of wooden pavement, whether the grain be placed in an inclined or in a vertical position; and finally, according to my eighth mode, I claim the right of laying down concave iron plates upon longitudinal bearers of wood for forming the gutters of streets in combination with any kind of pavement:

Now, therefore, I do hereby wholly disclaim so much of the title of my said invention, and of the said specification to my said patent, and of any right thereby claimed, as relates to improvements in railroad and other carriages, including the mode of lifting the horse set forth in my specification; and I do hereby further disclaim, in reference to my improvements in railways on common roads, by laying down tram-rails and edge-rails in the same continuous line as in my said specification and hereinbefore set forth, all right to the mode of securing both
242 or either of the said sorts of rails down upon bearers of wood by nails driven through the iron and through the wood, with continuous bearers of asphalte or other suitable cement in manner in the said specification mentioned or otherwise; and I do hereby further wholly disclaim all right to my third mode of improvements in roads and ways in the said specification mentioned; and I do hereby further disclaim, in reference to my fourth mode of improvements in roads and ways, all right of paving with planks of wood, and also of making grooves cut in the sides of any planks, and of placing tongues or keys, in manner in the said specification mentioned, in grooves cut in planks; and I do hereby further disclaim, in reference to my fifth mode of improvements in roads and ways, all right to the use of any such lever or coulter as is described and claimed by my said specification; and I do hereby also wholly disclaim all right to the seventh and eighth modes of improvements in roads and ways respectively in my said specification mentioned.

243 In witness whereof, I, the said Thomas Parkin, have hereunto set my hand this tenth day of April, one thousand eight hundred and forty.

THOMAS PARKIN.

To the clerk of the patents of England:

This is to certify that the before-mentioned Thomas Parkin, of Moorgate street, in the city of London, has applied to me for leave to enter with you the above-written disclaimer of part of the title and of the

specification of a certain invention for which letters patent were duly granted to him, under the great seal, dated at Westminster, the ninth day of April, one thousand eight hundred and thirty nine, and the specification of which was enrolled on the ninth day of October, 1839; and, on considering of the said application, I directed him to advertise his said disclaimer in the London Gazette, and in the Times, and Morning Herald, and Morning Chronicle newspapers, and such advertisements have been duly made in the said Gazette on the fourteenth day of April, and in the Times, Morning Herald, and Morning Chronicle, on the fifteenth day of the same month, 1840, and no valid objection
244 having been made to the said application, I have accordingly granted leave to the said Thomas Parkin to file his said disclaimer, pursuant to the statute passed in the sixth year of the reign of his late Majesty King William the fourth, entitled "An act to amend the law touching letters patent for inventions."

THO'S WILDE,
Serjeants' Inn, Temple.

APRIL 6th, 1841.

And be it remembered that on the twenty-sixth day of April, in the year of our Lord 1841, the aforesaid Thomas Parkin came before our said lady the Queen in her chancery, and acknowledged the disclaimer aforesaid, and all and everything therein contained and specified in form above written. And also the disclaimer aforesaid was stamped according to the tenor of the statute made for that purpose.

Inrolled the twenty seventh day of April, in the year of our Lord one thousand eight hundred and forty-one.

245 *Disclaimer and memorandum of alteration.*

To all to whom these presents shall come, I, Thomas Harper Bennett, of the Dover road, in the county of Surrey, hat and cap manufacturer, send greeting:

Whereas Her Most Excellent Majesty Queen Victoria, by her letters patent under the great seal of Great Britain, bearing date at Westminster, the ninth day of April, in the second year of her reign, did, for herself, her heirs, and successors give and grant unto one Thomas Parkin, his ex'ors, adm'ors, and assigns, her especial licence, full power, sole privilege, and authority, that the said Thomas Parkin, his ex'ors, adm'ors, or assigns, or such others as he, the said Thomas Parkin, should at any time agree with and no others, from time to time and at all times thereafter during the term of years therein expressed, should and lawfully might make, use, exercise, and vend within that part of the United Kingdom of Great Britain and Ireland called England, her dominion
246 of Wales, and her town of Berwick-upon-Tweed, his invention of "improvements in railroad and other carriages, in wheels for such carriages, and in roads and ways on which they are to travel."

And whereas the said Thomas Parkin, in pursuance of a proviso in the said in part recited letters patent contained, did cause a particular description of the nature of his said invention, and in what manner the same is to be performed, by an instrument in writing under his hand and seal, to be inrolled in her said Majesty's high court of chancery on the ninth day of October, in the year of our Lord one thousand eight hundred and thirty-nine.

And whereas the said Thomas Parkin, after the granting the said let-

ters patent the sixth day of April, in the year of our Lord one thousand eight hundred and forty-one, applied to Sir Thomas Wilde, knight, then being attorney-general for Her present Majesty Queen Victoria for leave to enter with the clerk of the patents of England a disclaimer, bearing date the tenth day of April, in the year of our Lord one thousand eight
247 hundred and forty, by him, the said Thomas Parkin, and under the hand of him, the said Thomas Parkin, of part of the title and of the specification of the said invention for which the said letters patent were granted as aforesaid, and the said Sir Thomas Wilde, attorney-general aforesaid, under his hand in writing on the said sixth April, one thousand eight hundred and forty-one, on such application, duly granted leave to the said Thomas Parkin to file his said disclaimer, pursuant to the statute passed in the sixth year of the reign of his late Majesty King William the Fourth, entitled "An act to amend the law touching letters patent for inventions," and thereupon the said Thomas Parkin, according to the said leave so granted, afterwards, on the twenty-sixth day of April, in the year of our Lord one thousand eight hundred and forty-one, at the patent office, quality court, Chancery lane, duly filed the said disclaimer, bearing date the tenth day of April, one thousand eight hundred and forty aforesaid, and the said disclaimer was then, on
248 the said twenty-sixth day of April, in the year of our Lord one thousand eight hundred and forty-one, taken and acknowledged by the said Thomas Parkin, and which said disclaimer, leave, and acknowledgement aforesaid, were afterwards, on the twenty-seventh day of April, one thousand eight hundred and forty-one, duly enrolled in chancery of record.

And whereas by certain indenture of assignment, bearing date on or about the tenth day of June, in the year of our Lord one thousand eight hundred and forty-two, made between the said Thomas Parkin, of the one part, and me, the said Thomas Harper Bennett, of the other part, the said letters patent were, for the considerations in the said indenture mentioned, assigned, transferred, and set over unto me, the said Thomas Harper Bennett, my ex'ors, adm'ors, and assigns.

And whereas I, the said Thomas Harper Bennett, am desirous for good and sufficient reasons hereinafter mentioned, to enter a disclaimer of that part of the title of the said invention hereinafter next
249 mentioned, and of the said specification and memorandum of alteration in title in the said specification, and have obtained leave of Her Majesty's attorney-general, certified by his fiat and signature according to the form of the statute in such case made and provided.

Know ye therefore that I, the said Thomas Harper Bennett, being possessed of the said letters patent under and by virtue of the said assignment thereof to me as aforesaid, do hereby, for the reason of making the title of the said invention consistent with the disclaimer and memorandum of alteration, hereby by me made and applicable to the said invention, only remaining undisclaimed and in force and effect after the making of this my disclaimer and memorandum of alteration, enter my disclaimer, and do hereby disclaim the following part of the title of the said invention; that is to say, I hereby disclaim the words "in railroad and other carriages, in wheels for such carriages," and also the words, "on which they are to travel." And I, the said Thomas Harper
250 Bennett, do hereby, for the reason aforesaid, enter my memorandum of alteration, and I do hereby, for the reason aforesaid, alter the title of the said invention of "Improvements in railroad and other carriages, in wheels for such carriages, and in roads and ways on which they are travel," by striking out the words "in railroad and other

carriages, in wheels for such carriages, and on which they are to travel," and by adding after the words in the said title, "in roads and ways," the words following, viz, "made or paved with wood on which carriages are to travel," so that after the said disclaimer and alteration the title of the said invention will be and now is, invention of "Improvements in roads and ways made or paved with wood on which carriages are to travel." And also I do hereby, for the reason aforesaid, disclaim and alter the said specification in the recital therein of the said letters patent by stating the title of the said letters patent as so disclaimed and altered as aforesaid, instead of the title of the said patent before the same was disclaimed and altered; and also that I hereby further disclaim, on the ground and for the reason of want of novelty, the right of
251 elevating the horse entirely off the ground on declivities down which the carriage can run by its own weight, the elevation of the horse being combined with a break to regulate the speed of the descent or to stop the progress of the vehicle at any part of the declivity, and in combination also with the turning of the hinder axletree of the carriage to make it go in a curvilinear direction, as in the said specification mentioned; and all right and claim thereto, and every part thereof, and all words in the said specification relating thereto. And I further hereby disclaim, on the ground of want of novelty, the placing of the axletree and fore wheels forwards, near or beyond the front of the carriage in the combination, by which the weight of the carriage is thrown so far behind the horses as to more than counterbalance them when suspended, as in the specification mentioned, and all right and claim thereto, and all and every part thereof. And I further hereby disclaim, on the ground and for the reason of want of novelty, the right of making railway wheels
252 with pieces of wood extending from the nave or axle to the periphery, the wood being secured together by bolts between cheeks or plates and rings on each side, two examples of which construction are shewn at 4, 5, and 6, and 7 and 8, as in the specification mentioned, and all right and claim thereto, and all and every part thereof. And I further hereby disclaim, on the ground and for the reason of want of novelty, the right of bolting or screwing on a ring to form the flanch in any kind of railway wheel, so that the flanch may be replaced by a new one when it is worn out before the rest of the wheel, as in the said specification mentioned, and all right and claim thereto, and all and every part thereof.

And in regard of the third head or improvement upon the wheels of carriages to run upon common roads, I hereby further disclaim, on the ground and for the reason of want of novelty, the right of constructing the outer part of the felloe of two rings composed of short pieces of wood, having the end of the grain standing against the circumference and bolted to and through a middle rib projecting all around from
253 and constituting part of the inner felloe of iron, as in the said specification mentioned, and all right and claim thereto, and all and every part thereof.

And in regard to the fourth head, namely, the improvement upon the wheels of carriages to run alternately upon common roads and upon railways, I further hereby disclaim, on the ground and for the reason of want of novelty, the right of combining a rim or tire of iron to run upon a common road with a tire of wood, having the grain lying nearly in the direction of the radius, bolted on in short pieces by the side of the iron rim, the external part of the wood which is to run upon the railway being of less diameter than the iron ring which is to run upon

the common road, as in the specification mentioned, and all right and claim thereto, and to all and every part thereof.

And in reference to the fifth head, respecting the improvements in railroads, I further hereby disclaim, on the ground and for the
254 reason of want of novelty, the formation of the rails of hard wood placed with the end of the grain in or nearly in a vertical position, and of laying the same in a bed of concrete of cement, or of gravel, as in the said specification mentioned, and all and every part thereof.

And in respect of the sixth head, namely, improvements in railroads on common roads, I hereby further disclaim, on the ground and for the reason of want of novelty, the using of tram-rails in cases where carriages are allowed to cross the road, and in front of buildings leading on to edge-rails in other parts of the road, as in the specification mentioned, and all right and claim thereto, and to all and every part thereof; and I further hereby disclaim, on the ground and for the reason of want of novelty, the leading pieces forming the communication between the tram-rails and the edge-rails, as in the said specification mentioned, and all right and claim thereto, and to all and every part thereof; and I hereby further disclaim, on the ground and for the reason of want
255 of novelty, the nailing down of iron rails through wooden bearers upon bearers of cement or asphalte, with nails having thick points and comparatively thin shanks, as in the said specification mentioned, and all right and claim thereto, and to all and every part thereof.

And in the seventh head of improvements in roads and ways in the said specification mentioned, as well in the descriptive part as in the claiming part thereof, I hereby, for the reason of precision and certainty, do disclaim in the words of the said seventh head of improvements in the said descriptive part of the said specification following, that is to say, "in paving them with blocks of wood having the grain inclined to the horizon in some angle varying from about forty-five degrees to about seventy degrees," the word "about," where it is used respectively before the words "forty-five degrees" and also before the words "seventy degrees," thus making the words to run varying from forty-five to seventy degrees; and in the words of the said seventh head in the claiming part of the said specification following, that is to say, having
256 the grain inclined to the horizon from about forty-five degrees to about seventy degrees, the word "about," where it is used respectively before the words "forty-five degrees" and also before the words "seventy degrees," thus making the words to run "inclined to the horizon from forty-five degrees to seventy degrees"; and I recommend dowelling as in the said specification mentioned, yet I hereby disclaim, on the ground and for the reason of want of novelty, the dowelling of the blocks together in pairs when slanting or leaning in opposite directions, as in my said specification mentioned, and all right and claim thereto. And I further hereby disclaim, on the ground and for the reason of want of novelty, the right of paving with wood, having the grain vertical, horizontal, or inclined, in combination with a great number of rails driven into the upper surface, to diminish the wear and afford a hold for the horses' feet, as in the said specification mentioned, and all right and claim thereto, and to all and every part thereof.

257 And I do hereby, for the reason and on the ground of want of novelty, further disclaim, in reference to the fourth mode of improvements in roads and ways, all right of making grooves cut in the sides of any planks and of placing tongues or keys in manner in the said specification mentioned in grooves cut in planks, and all claim

thereto. And I hereby further disclaim, on the ground and for the reason of want of novelty, the right of cementing blocks or pieces of wood together by filling up the interstices between them with a mixture of earthy matter united with pitch or other bituminous subtance or suitable cement which will melt with heat and yet remain firm at the highest summer temperature, as in the said specification mentioned, and all right and claim thereto, and to all and every part thereof. And I hereby further disclaim, on the ground and for the reason of want of novelty, the right of using a hot iron lever and a hot iron or
258 copper plough or coulter attached to a truck to melt the cement out of the interstices between the blocks, when it is required to take them up for the laying or repairing of water and gas pipes, as in the said specification mentioned, and all right and claim thereto, and to all and every part thereof. And I hereby further disclaim, on the ground and for the reason of want of novelty, the right of laying upon the natural ground or foundation of the road a layer of sand, ashes, or sawdust, saturated with tar or other bituminous substance, especially if boiled, for the blocks to rest upon, as in the said specification mentioned, and all right and claim thereto, and to all and every part thereof. And I hereby further disclaim, on the ground and for the reason of novelty, the right of making grooves or furrows in the upper surfaces of wood or pavement, whether the grain be placed in an inclined or in a vertical position, as in the said specification mentioned, and all right and claim thereto, and to all and every part thereof. And I
259 hereby further disclaim on the ground and for the reason of want of novelty, the right of laying down concave iron plates upon longitudinal bearers of wood for forming the gutters of streets in combination with any kind of pavement, as in the said specification mentioned, and all right and claim thereto, and to all and every part thereof. And I, the said Thomas Harper Bennett, do also hereby declare that my reasons for making and entering the above disclaimer and memorandum of alteration are the reasons above by me stated. And I, the said Thomas Harper Bennett, do hereby further declare that the above disclaimer and memorandum of alteration are not, nor is either of them, or any part thereof, such disclaimer or alteration as will extend the right granted by the said letters patent.

In witness whereof, I have hereunto set my hand and seal this nineteenth day of July, in the year of our Lord one thousand eight hundred and forty-three.

THOMAS HARPER BENNETT. [L. S.]

260 To the clerk of the patents of England:

This is to certify that the above-named Thomas Harper Bennett, of the Dover Road, in the county of Surrey, hat and cap manufacturer, has applied to me for leave to enter with you the above-written disclaimer and memorandum of alteration of part of the title and specification of a certain invention for which letters patent were granted to the above-named Thomas Parkin, under the great seal of Great Britain, dated at Westminster, the ninth day of April, one thousand eight hundred and thirty-nine, and to which a specification was duly enrolled; and having considered of the said application, and no valid objection having been made to the same, I have accordingly granted leave to the said Thomas Harper Bennett to file his said disclaimer and memorandum of alteration pursuant to the statute passed in the fifth and sixth years of the reign

of his late Majesty King William the Fourth, entitled an act to amend the law touching letters patent for invention.

FRED. POLLOCK.

TEMPLE, *July 19th*, 1843.

261 And be it remembered, that on the twenty-first day of July, in the year of our Lord 1843, the aforesaid Thomas Harper Bennett came before our said Lady the Queen in her chancery, and acknowledged the disclaimer aforesaid, and all and everything therein contained, and also the disclaimer aforesaid was stamped according to the tenor of the statute made for that purpose.

Enrolled the twenty-fourth day of July, in the year of our Lord one thousand eight hundred and forty-three.

DUCKWORTH.

[Here follows diagram.]

262 *Defendant's Ex. No.* 10—*E. G. T., S. E., Jan'y* 20, '71.

A. D. 1840. No. 8473.

Grimman's specification.

To all to whom these presents shall come, I, William Grimman, of 7 Camden street, Islington, in the county of Middlesex, modeller, send greeting:

Whereas her most excellent Majesty Queen Victoria, by her letters patent under the great seal of Great Britain, bearing date at Westminster, the fifteenth day of April, in the third year of her reign, did, for herself, her heirs and successors, give and grant unto me her
263 especial licence that I, the said William Grimman, my ex'ors and adm'ors and assigns, should at any time agree with, and no others, from time to time, and at all times during the term of years therein expressed, should, and lawfully might make, use, exercise, and vend within England, Wales, and the town of Berwick-upon-Tweed, my invention of a new mode of wood paving; in which said letters patent there is contained a proviso obliging me, the said William Grimman, by an instrument in writing under my hand and seal, particularly to describe and ascertain the nature of my said invention, and in what manner the same is to be performed, and to cause the same to be en-
264 rolled in Her Majesty's high court of chancery, within six calendar months next and immediately after the date of the said recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear:

Now, know ye (that in compliance with said proviso), I, the said William Grimman, by this instrument in writing, under my hand and seal, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, is particularly described and ascertained as follows (that is to say):

And first, my invention consists in the application of blocks of
265 a certain figure, and formed in a certain manner, or cut according to a certain angle for the purpose of carriage-road pavements, foot pavements, court yards, coach-house floors, stables, carriage-drives, &c.; and the mode by which I propose to carry such intention into effect is as according to the following methods: I take blocks of wood, whose face, cut vertically, form a regular figure, for instance, say a par-

allelogram, whose longest side is twice its breadth, and its depth equal to its longest side of the face, the sides forming a rhombus or rhomboid of an angle of 77 degrees or thereabouts, the form or plan where-
266 of is given in the margin hereof, and marked A. And I further claim the invention of the mode of applying these blocks thus made to the purpose of carriage-way pavement, &c., and which is thus effected: I lay down the block No. 1, in the annexed plan (marked B), the depths on the sides A D forming an inner angle of 77°, and those of the sides B C forming an outer angle also of 77°. I then place the block No. 2, with its inner angle E, against the outer angle B, of block No. 1, and its inner angle F parallel with the inner angle of A, block 1. Block No. 3 is then placed, its inner angles I and K being placed against the outer angles B and H of blocks No. 1 and 2. No. 4 is then laid down with its inner angle N against the outer angle C of block No. 1, and the outer angle O against the inner angle 1
267 of block 3. The block No. 5 follows, with the outer angles S and T against the inner angles B No. 1 and N No. 4. No. 6 is placed against blocks No. 1 and 5, with its outer angles against the inner of the before-placed blocks 1 and 5. In like manner, also, block No. 7 is placed. The block No. 1 being then entirely surrounded by those Nos. respectively 2, 3, 4, 5, 6, and 7, and being equally pressed upon or equally pressing upon one or more of them, becomes firmly fixed in its situation. In like manner the block No. 4, on being surrounded by blocks No. 5, 1, 3, 10, 9, and 8, placed with the same attention to the inner and outer angles, becomes also fixed; and the same principle applies to each single block until the space to be covered having
268 been filled in this manner, as far as whole blocks will accomplish it, the filling in of the residue is effected by cutting the blocks horizontally on the side nearest the extremity of the work to be covered to fit the aperture, and the whole will then form one solid mass. I also propose to lay these blocks on a concrete foundation, brought to a smooth or level surface, either by a fine concrete, or a thin layer of asphalte, or by laying thin slabs of wood on the concrete.

And I hereby declare the foregoing to be my invention as to the mode and [here follows diagram] manner of cutting, and also as to the principle of placing the said blocks for the purposes before specified;
269 and I further claim the invention of applying this principle to any block of wood or blocks of wood whose vertical end having a regular figure will, by the application of an outer angle on one block to the inner angle of another, and by continuity, form one solid mass by pressing upon or by equally being pressed upon by the block adjoining, be the angle of inclination more or less than 77°. And I do not claim the privilege of invention to the concrete or to the covering the same with asphalte, or laying thin slabs of wood on the concrete. And my invention or mode of wood paving further shown or explained by the plans delineated in the margin of these presents.

In witness whereof I, the said William Grimman, have hereunto
270 set my hand and seal this twelfth day of October, in the year of our Lord one thousand eight hundred and forty.

WILLIAM GRIMMAN. [L. S.]

And be it remembered that on the twelfth day of October, in the year of our Lord 1840, the aforesaid William Grimman came before our said lady the Queen, in her chancery, and acknowledged the specification aforesaid, and all and everything therein contained and specified, in form above written. And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

Inrolled the twelfth day of October, in the year of our Lord one thousand eight hundred and forty.

271 *Def't's Ex. No.* 11., *E. G. T., S. E.—Jan'y* 20, '71.

A. D. 1839.—No. 8041.

PAVING ROADS, BRIDGES, &C.

Stead's specification.

To all to whom these presents shall come, I, David Stead, of Great Winchester street, in the city of London, merchant, send greeting:

Whereas her most excellent Majesty Queen Victoria, by her letters patent, under the great seal of Great Britain, bearing date at Westminster, the twenty-third day of April, in the second year of her reign, did for herself, her heirs and successors, give and grant unto me, the said David Stead, her especial license that I, the said David Stead, my
272 ex'ors, adm'ors, and assigns, or such other as I, the said David Stead, my ex'ors, adm'ors, and assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should, and lawfully might, make, use, exercise, and vend within that part of Her Majesty's United Kingdom of Great Britain and Ireland called England and Wales and the town of Berwick-upon-Tweed, and also in all Her said Majesty's colonies and plantations abroad, my invention, partly a communication from a foreigner and partly my own discovery and invention, of "An improved mode or method of making or paving public streets and highways and public and private roads, paths, courts, and bridges with timber or
273 wooden blocks"; in which said letters patent there is contained a proviso obliging me, the said David Stead, by an instrument in writing under my hand and seal, particularly to describe and ascertion the nature of my said invention, and in what manner the same is to be performed, and to cause the same to be enrolled in Her said Majesty's high court of chancery within four months next and immediately after the date of the said recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear:

Now know ye, that in pursuance of the said proviso and in compliance therewith, I, the said David Stead, do hereby declare the nature
274 of the said invention and the manner in which the same is to be performed, are fully described and ascertained by the following description thereof, reference being had to the drawings and figures marked thereon; that is to say: The invention consists in the paving and formation of the roadway of public and private ways and passages by means of wooden blocks, so shaped and placed as to support each other in a close and compact manner, the foundation being first suitably prepared to the required figure by the usual well-known means to receive such wooden blocks, which are so disposed as to present an even and uniform surface, and always having their fibre in a vertical posi-
275 tion, whether the roadway has a curved, inclined, or horizontal face. The blocks which I use for the improved paving are cut transversely out of fir or other suitable timber, or they may be composed of deal plank ends or small pieces of timber firmly cemented together to any of the required figures hereinafter described, by means of asphalt or any other suitable material. And when it is required to form a road-

way upon a steep aclivity, I propose to place the blocks or to have them of such form or forms as are hereinafter described, so that channels and cavities shall be left to afford a surer footing or hold for the feet of the animals traversing over such inclinations.

The following is a description of the drawing annexed hereto, and which is to be considered as part of this my specification.

276 Figure 1 and figure 2 is a plan and elevation of a road formed with inclined surfaces from the centre of the road, such road being mainly composed of hexagonal-shaped blocks *a a*, placed with the fibre vertical against and supporting each other, the sides or parts nearest the curb-stone of such roadway being squared, made parallel, and finished to the curb-stone by means of the required portions *b b* of such hexagons, as before described, and the whole keyed and made firm to the inclination of the roadway by means of the pyramidal hexagonal wedges *c c*, which are to be introduced and driven tight between the hexagons forming and nearest to the centre of the road, or the

277 roadway may be constructed without such wedges, by a series of hexagons, as represented at figure 3, by cutting off the upper and under surfaces of the same to such a bevil as will correspond with the required inclination; the portions of such hexagonal blocks which are intended to be cut away are colored red in this figure.

Figures 4 and 5 represent a plan and elevation of a portion of an improved paving, suited to a road having a curved surface, being formed of quadrangular blocks, diminishing from their upper to their lower surfaces, and slightly spherical on the top.

Figures 6 and 7 is a plan and elevation of another kind of level

278 roadway, formed of blocks in shape resembling two parallelopipedons placed transversely, although cut out from one solid piece; the upper portion of such block is so formed that the greatest width, *d d*, Figure 6, extends beyond the narrower width of the lower portion of the block *e e*, and thereby both the upper and under part of such block provides rebates or ledges, *f f*, figure 7, for the adjoining block to fit under and rest upon, each making the other firm and secure.

Figures 8 and 9 represent a plan and elevation of a portion of a road constructed with improved road-blocks resembling two hexagons. These are formed in a similar manner, out of one piece, to the figures last

279 described, and have corresponding projections, both above and below. to sustain each other.

Figure 10 and 11 is a plan and elevation of another portion of the improved paving, which consists of a lower course of hexagons placed beneath and supporting an upper layer. The lower hexagons *g g* being only about one-third of the depth of those which rest upon them, are fitted according to the black lines in the plan view, figure 10, and the upper hexagons, represented by the red lines, figure 10, are so placed that one angle, *h*, of each rests on the centre of that immediately beneath, and thereby causes one of the upp r hexagons to hold down and overlay a portion of three of those immediately beneath.

280 Figures 12 and 13 represent a plan and elevation of a similar kind of paving to the last described, and consists of an upper and lower course, the lower course being formed of triangular blocks placed according to the black lines in figure 12, and the upper layer of a series of parallelopipedon-shaped blocks, represented by the red lines, figure 12, laid upon them, with the fibrous or smaller end upwards, the upper course holding down and firmly securing the triangularly-formed base upon which it rests.

Figures 14 and 15 is a plan and perspective view of triangular-shaped blocks for forming a roadway without a lower course.

281 Figures 16 and 17 is a plan and end view of another kind of the improved paving, which is formed by a series of circular blocks, *i i i*, placed as represented in the drawing, and made parallel to the curb-stone of the footway by the semicircular and quadrant pieces *j* and *k*; the smaller interstices or cavities between such circular blocks may be either filled with wooden pieces suited to their shape, or fitted up with cement or asphalte, as may be found convenient; and when this kind of paving is laid upon an inclined surface, I should recommend the cavities to be not filled up (provided the circular blocks are not too large, so as to render such cavities inconveniently large),

282 as additional hold may be thereby afforded to the feet of draught animals ascending such inclined way, as already alluded to.

Figures 18 and 19 is a plan and side view of a portion of a roadway formed by a series of octangular blocks, L L, placed with the fibre vertical, so as to leave a square recess or interval between them, into which may be inserted a corresponding piece, *m*. When this kind of paving is laid upon a road formed upon a newly-made embankment or shrinking base, I should recommend a pile to be driven into the earth through the square recess or interval of about the size and form represented by the dotted lines, figure 19, in order to support and keep the blocks

283 firm in their position. When the octangular block-paving is used for acclivities, I should recommend the before-mentioned cavities either to be left unfilled, or not filled up to the surface, to afford an assistance to animals ascending, the same as before described.

Figure 20 is another manner of placing an improved roadway when constructed of hexagonal blocks, being placed angle to angle instead of side to side, so as to leave triangular spaces between them if used for inclined or other roadways, which may be filled up or left partly unfilled for the purposes hereinbefore alluded to; or a series of deal-

284 ends, composed of portions of a plank cut transversely, may be introduced betweed the hexagons, as represented, *v v*, so as to leave a portion projecting above the surface to afford the hold for the feet of horses or other animals, as before stated.

Figures 21 and 22 is a plan and perspective view of a portion of another kind of roadway, formed of a series of parallelopipedon-shaped blocks, *w w*, placed with the fibre vertical, and having a portion of the upper part of each side cut away so as to form continuous longitudinal and tran'verse channels extending over the whole surface of roadway in lines parallel to each-other, whether the blocks be laid at right

285 angles to each other or in a diagonal direction. These channels may be left open or so filled up with cement as to leave a slight space unfilled beneath the top surface to afford the hold to the horses' feet, as already described.

Figure 23 is a perspective representation of several other kinds of blocks suited to form a roadway; these consist of blocks of the parallelopipedon shape before described, or they may be cubical, having a portion of the upper part of one side cut away, as seen at O, or with a portion of the upper part of two sides cut away, as at *p p* and *q q*, or with the under sides cut away either horizontally or obliquely, as seen at *r r*, all of which blocks are so contrived that they adjust and cor-

286 respond to each other, and may be used wholly to construct a roadway, or with advantage to close and key up parallel to the curb-stone, when the greater portion of a roadway is formed by any of the other shapes herein set forth and described.

Figures 24 and 25 are perspective and plan views of several oblong road-blocks of different forms, which have one or more sides formed by angles or curves, and which sides fit into corresponding angular or curved cavities, as seen at *s s*, or only one side may be angular or curved, and the other side or sides have horizontal or oblique projections formed, as seen at *t t*, corresponding with and fitting each
287 other, and all of which are so constructed as to easily fit and combine into a whole surface, or a portion only of any of the forms may be used and adapted to finish the sides of a road, as hereinbefore set forth and described.

Having now fully described the nature of the said invention, and the manner in which the same is to be carried into effect, I wish it to be understood that I claim as the invention the formation of a road inclined from the centre to the sides thereof, constructed by hexagons and keyed at the highest part thereof by the half-pyramidal hexagonal wedges, as represented at figures 1 and 2; and I wish it to be understood that, although I only mention the polygonal figure known
288 as a hexagon, yet I do not mean to confine myself to that precise form, as any other polygonal-shaped block may be used and come within the principle of the invention for the purpose herein described.

I also claim the construction of a roadway by polygonal or rhomboidal shaped blocks, as represented at figure 3.

I also claim the formation of a public or private road or passage way by means of the upper and lower courses of blocks, as shewn at figures 10, 11, 12, and 13, whether formed of polygonal-shaped blocks, or blocks resembling cubes, parallelopipedons, triangles, or rhomboids, or of other forms.

289 I also claim the road-blocks represented in figures 23, 24, and 25, having angular or curved sides, or angular and concave sides, or having horizontal or oblique projections, or both united in one block, whether for the purpose of forming an entire road, or finishing and squaring up a road parallel to the curb-stone, when such road is formed of blocks of different shapes.

I also claim the formation of a road by means of blocks, as represented at figures 21 and 22, with a portion of the upper sides so cut away as to form cavities for the purpose hereinbefore described, whether such blocks are parallelopidedons, cubes, or polygons.

I also claim the formation of a roadway by means of such
290 blocks as I have desscribed and set forth in figures 6, 7, 8, and 9.

In witness whereof I, the said David Stead, have hereunto set my hand and seal this twenty-third day of August, in the year of our Lord one thousand eight hundred and thirty-nine.

D. STEAD. [L. S.]

And be it remembered that on the twenty-third day of August, in the year of our Lord 1839, the aforesaid David Stead came before our said lady the Queen, in her chancery, and acknowledged the
291 specification aforesaid and all and everything therein contained and specified, in form above written.

And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

Inrolled the twenty-third day of August, in the year of our Lord one thousand eight hundred and thirty-nine.

BROUGHAM.

[Here follows diagram.]

292 *Def't's Ex. No.* 12, *E. G. T., S. E., Jan'y* 20, '71.

A. D. 1840. No. 8657.

BLOCKS FOR PAVING.

Wood's specification.

To all to whom these presents shall come I, Thomas Wood, the younger, of the Wandsworth road, in the parish of Clapham, in the county of Surrey, gentleman, send greeting:

Whereas Her Most Excellent Majesty Queen Victoria, by her letters patent under the great seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster, the seventh day of
293 October, in the fourth year of her reign, did, for herself, her heirs, and successors, give and grant unto me, the said Thomas Wood, the younger, her especial license that I, the said Thomas Wood, the younger, my ex'ors, adm'ors, and assigns, or such others as I, the said Thomas Wood, the younger, my ex'ors, adm'ors, and assigns, should at any time agree with, and no others, from time to time, and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the town of Berwick-upon-Tweed, my "improvements in paving streets, roads, bridges, squares, paths, and such like ways," in which said letters patent there is contained a proviso obliging me, the said
294 Thomas Wood, the younger, by an instrument in writing under my hand and seal, particularly to describe and ascertain the nature of my said invention, and in what manner the same is to be performed, and to cause the same to be enrolled in Her Majesty's high court of chancery within six calendar months next and immediately after the date of the said recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

Now know ye, that, in compliance with the said proviso, I, the said Thomas Wood, the younger, do hereby declare that the nature
295 of my said invention, and the manner in which the same is to be performed, are described and ascertained by the drawings in the margin hereof, and the words following, that is to say: The blocks I use for paving are of two forms, viz: the section of the pyramid having either a square base (Fig. A) or an elongated base (Fig. B), and the double wedge cut from either a similar square base (Fig. C) or a similar elongated base (Fig. D). I confine myself to no particular dimensions for the blocks, neither to any particular angle, only the sections of pyramids and the double wedges must all be cut at the same angle.

The most advantageous at which to cut or mould the blocks, range from 70 to 88 and ½ degrees.

296 I do not confine myself to any particular substance or material for blocks. They may be of stone, wood, or any other substance or material suitable for pavings.

The peculiar construction, combination, or arrangement I adopt is as follows: I dispose the block so that every other block, in one series of blocks, is the section of the pyramid stading on its smaller end (Fig. E), and every other block, in another series of blocks, is the section of the pyramid standing on its base (Fig. F.) The intervening blocks of both series (*a*, *a*, *a*, *a*, *a*) are the double wedges, which, from their peculiar form, combine equally well with the sections of pyramids, whether
297 these latter be placed on their smaller end or on their base; and a number of such alternate series of blocks being placed across a road, all the blocks are made to lean and press on each other on all

sides, in mutual support (Fig. G). The half blocks, *b*, *b*, *b*, *b*, *b*, are introduced to break joint. In putting down this pavement I leave those series of blocks which have the bases of the sections of pyramids upwards a little elevated, say half an inch, more or less, above the other series which have the bases of the sections of pyramids downwards.

When the whole space to be paved is covered to the abutments (viz, curb-stones, walls, or other usual and secure boundaries) with
298 blocks put closely together, as described above, I then drive those series which were left elevated down to the general level, taking care, moreover, to drive those blocks which are sections of pyramids with their bases upwards last.

In this manner I can wedge the road together with any degree of intensity so as to prevent all displacement, and give it a complete firmness and solidity, even when put down on a foundation of mere shingle, gravel, or sand. Those blocks which are sections of pyramids with the bases upwards, being drawn, the road is unlocked, and may be taken up in whole or in part.

I sometimes adopt modifications of the above construction of pavement.

299 The first modification (Fig. H) has the twofold advantage of affording a secure foothold to horses, and of throwing the weight and pressure of the traffic on those blocks which (being the sections of pyramids with the bases upwards), when pressed or driven, tend to consolidate the road. This is affected by making those blocks taller than the rest, say half an inch, more or less.

The second modification (Fig. I) takes the weight and pressure of the traffic off those blocks which, by their form and position, sustain the blocks around them, and in consequence here again the very
300 traffic tends to consolidate the road. This is affected by making those blocks which are the sections of the pyramids standing on their bases somewhat shorter than the rest, say half an inch, more or less.

The third modification (Fig. K) has the twofold advantage of affording a secure foothold to horses, especially on an inclined plane, and of throwing the whole weight and pressure of the traffic on those blocks which (having the larger surface upwards), on being pressed or driven, tend to consolidate the road. This is affected by making those series somewhat taller than the rest, say half and inch, more or less. I
301 sometimes make those series considerably taller, say from one inch to three inches, more or less, and I then fill in the spaces *c*, *c*, *c*, *c*, between the alternate series with concrete, or coal-tar, asphalte, or other bituminous substance, heated and mixed with gravel, sand, or such like material.

I do not claim as my invention the two forms of blocks which I have described as above, and which I use in my method of paving, because they are mathematical forms, and are known to scientific men in general. But I claim as my invention the peculiar combination, construction, or arrangement of blocks of those forms which I have specified and described herein.

302 And I claim likewise as my invention the modification of that peculiar combination, construction, or arrangement, which modifications I have also specified and described herein.

In witness whereof I, the said Thomas Wood, the younger, have hereunto set my hand and seal, the thirtieth day of March, in the year one thousand eight hundred and forty-one.

THO. WOOD, JUN'R. [L. S.]

And be it remembered that on the thirtieth day of March, in the
303 year of our Lord 1841, the aforesaid Thomas Wood, the younger, came before our said lady the Queen, in her chancery, and acknowledged the specifications aforesaid, and all and everything therein contained and specified, in form above written.

And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

Inrolled the second day of April, in the year of our Lord one thousand eight hundred and forty-one.

FARRER.

(Here follows diagram.)

304 *Def't's Ex. No.* 13, *E. G. T., S. E., Jan'y* 20, '71.

A. D. 1840. No. 8663.

PAVING STREETS, ROADS, AND WAYS.

Pinkus' specification.

To all to whom these presents shall come, I, Henry Pinkus, of 36 Maddox street, Regent street, in the county of Middlesex, esquire, send greeting:

Whereas Her present Majesty, Queen Victoria, in and by her letters patent under the great seal of Great Britain, bearing date at Westminster, the fifteenth day of October, one thousand eight hundred and forty, for herself, her heirs and successors, did give and grant unto
305 me, the said Henry Pinkus, her especial licence, full power, sole privilege and authority, that I, the said Henry Pinkus, my executors, administrators, and assigns, and every of them, by myself and themselves, or by my and their deputy or deputys, servants or agents, or such others as I, the said Henry Pinkus, my executors, administrators, or assigns should at any time agree with, and no others, from time to time and at all times thereafter, during the term of years therein unexpired, should and lawfully might make, use, exercise, and vend within England, Wales, and the town of Berwick-upon-Tweed, and also the colonies and plantations abroad, my invention for "An improved
306 method of combining and applying materials applicable to formation or construction of roads or ways;" in which said letters patent there is contained a proviso, obliging me, the said Henry Pinkus, by an instrument in writing under my hand and seal, particularly to describe and ascertain the nature of my said invention, and in what manner the same is to be performed, and to cause the same to be enrolled in Her Majesty's high court of chancery within six calendar months next and immediately after the date of the said recited letters patent, as in and by the same, reference being thereunto had, will more fully appear.

Now know ye that, in compliance with the said proviso, I, the
307 said Henry Pinkus, do hereby declare that the nature of my said invention and the method of carrying it into effect is set forth and described in the following specification, reference being had to the several drawings, plans, sections and elevations numbered from one (I) to (VII), inclusive, accompanying the same; and consists in the methods of combining materials so as to form foundations as bases for superstructures of roads, ways, streets, or rail or tram ways, and applying to said combination fixtures so as to suit said combinations or structures to the impelling of common or improved vehicles thereon.

With the objects, therefore, firstly, in order to form the paved
308 ways of streets for the use of superstructures of wood or stone, or similar material, I form a foundation of rough, close-set rubble-stones *a*, *a*, *a*, *a*, with their broad faces down and their pointed ends up, sectional end view and elevation, figure 1, drawing No. II.

These should be of from five to eight inches broad on their lower faces and of from seven to twelve inches high in the middle part of the road, and may gradually diminish in size towards the sides.

The upper interstices between the stones should be filled up compactly with chips of broken stones, so as to form a compact mass, which,
309 when laid along a street or road, should have a proper curvature for drainage, equal to a declination about nine inches in twenty feet. The surface should be rammed or rolled so as to form an even surface; common grouting may be applied thereto.

In beds of foundations so formed, or on beds of broken stone, I lay in parallel lines all along said roads or streets, buttress-sleepers *b*, *b*, *b*, *b*, *b*, of the form or similar forms shown; these constitute the abutments of arches of short span by which the road or street is divided tran'-versely. Transums or ties may be placed at convenient distances to maintain parallelism of the buttress-sleepers when necessary on loose soils, or the buttresses may be laid on ends of piles *a*, *a*, *a*, figure 2, drawing No. II. When water or gas mains are laid, the parallels
310 of the buttress sleepers should be so arranged as that said mains should be between any two buttresses, so as to get access to them without disturbing the structures in other parallels; or, in lieu of said rough rubble foundation, I form a foundation of broken stones, *a*, *a*, *a*, figure 3, drawing No. II, about four or five inches in depth, applying thereto the buttress-sleepers, as before; or, in lieu of said broken stones, I form a foundation of rough bricks, *a l*, *a l*, *a l*, elevation, figure 2, drawing No. II, and A, A, A, A, plan drawing No. IV; these are formed into squares, B, B, B, No. IV, and forming arches of slight curvatures resting against the buttress-sleepers, the arches having brick abutments *d l*, *d l*, *d l*, laid longitudinally so as to form interstices about two
311 feet square; the bricks of the arches and their abutments are laid with their longest narrow sides upwards, and with one or more layers of bricks. The level part of the buttress-sleeper is above the surface-level of the arches.

The bricks may be pointed with mortar or cement. The spaces or interstices may be filled in with earth, well rammed in, or broken stones, sand, or gravel, and form a level surface with the level of the arches. With foundations so formed I combine and lay on a superstructure of wood, or stone blocks, or blocks of similar material, which I construct in the following manner:

I use a simple cubical block, *c*, *c*, *c*, *c*, figure 3, drawing I, figure 3, drawing II, figure 1, 2, drawing No. III, or blocks of rhomboidal form, *d*, *d*, *d*, *d*, figure 1, drawing No. II, and figure 3, drawing
312 No. III and V. The blocks are formed so as that the cross-section of their grain may be set horizontally.

The blocks may be six by six inches, or six by nine inches, or any other dimensions, on their face or sides. These I form into textile or woven masses in the following manner: In one or more sides of the blocks, near their middle part, I form circular or angular grooves *e*, *e*, *e*, *e*, figure 4, drawing No. III, that are in a line with the upper face of the blocks. This may be done economically by placing a series of blocks in rows on a level platform similar to a planing-machine, on which may be suspended a series of wheels parallel to one another, and on

313 the peripheries of which may be circular gouges. Revolution may be given to those wheels and the blocks made to move under the wheels in straight lines by regulated motion, which will bring the gouges by degrees in contact with the sides of the blocks, and so cut circular grooves.

Where angular grooves are to be formed on a similar platform, the blocks may be arranged as before; but in lieu of the before-mentioned wheels, a series of circular saws placed at an angle of 45° may be suspended on an axis, and in advance of those circular saws may be placed a similar set similarly suspended at an opposite angle of 45°, or standing at right angles to the former series. These may be regulated

314 to cut to any required depth, so that when the blocks on the platform are made to move under the circular saws, grooves are cut, the faces of which are at right angles one to the other.

These grooves may be cut on two opposite sides of the blocks, or on two sides, the one being at right angles with the other. This I weave together in masses, and lay them down on the foundation aforesaid, in such manner as that when a series of the grooves are laid face to face they form long grooves. Into these I insert long rods *g*, *g*, *g*, *g*, figures 1, 2, 3, 4, drawings Nos. I, II, III, of the form of the groove, being either roundish or square. The rods may be of from six to nine feet in length, and may be about an inch and a half in diameter.

315 When square rods are used they must be so applied as that the diagonal lines passing through their centres shall be two lines, 1, 2, and 3, 4, figure 4, drawing No. III, horizontal and vertical, so that any vertical pressure on the blocks shall bear on the vertical diagonal line 3, 4.

The grooves and rods should be so laid down as that one series of rods, 5, 6, should be at right angles with the line of the street or road, and another set, 7, 8, figure 2, drawing III, and figure 3, drawing No. II, in a line with the street or road, except where the blocks are laid diagonally with the line of road or street. In that case the rods will cross one another at right angles and diagonally with the line of road road or street, as in drawing No. 1.

When the blocks are laid down on said foundation they form

316 arches in single lines or masses, resting on said buttress-sleepers, the blocks in contact with which conform to the beveled form of the buttress-sleepers where the said rods are inserted at right angles one with the other, as in figure 3, drawing No. II, and figure 2, drawing No. IV; one series of grooves on the sides of the blocks are below or above the lines of grooves opposite or at right angles with those lines. The rods 5, 6, 7, 8, may either pass along the four sides of said blocks or along the sides of alternate blocks; in that case each block in a series will be supported by rods on two of its sides, as in figure 2, drawing No. III.

When rods are inserted laying parallel to one another, as in figures 3, drawing No. 3, the rods may be placed in said grooves along

317 opposite sides of each block or alternately, so that each block is supported on one side.

In order to facilitatate the repairing or temporary removal of any part of the mass so formed, I form near to the curbstones or any part of the buttress sleepers, key-blocks 9, 10, 11, figure 4, drawing No. III, by cutting one of said blocks into three parts, the centre par 10, which is cuniform or wedged shape, 9 and 11 may thus be placed on the rods, and then 10 inserted to fix them. In order to lessen the tendency of the slipping of horses on such pavements or roads, I bore on

the vertical face of each block a circular indent 1, 2, 3, 4, 5, 6, drawing No. 1, and figures 1, 2, drawing 3, about five inches broad and
318 one inch deep. Into each of these I put a composition, such as any of the asphaltums mixed with coarse gravel or sand, or what is called artificial granite.

I fill the indentations to a level with the upper faces of the blocks, or, in lieu of the said compositions, I insert into the indents a hard-burnt tile, which I cement by any of the aforesaid compositions.

Flagstones for sidewalks or pavements, may be supported by rods in a similar manner, and thus I construct what I denominate the textile or woven pavement.

When stone blocks are used, the grooves may be either cut in their sides, as in the wooden blocks, or a facing of artificial granite
319 put on and moulded in the form of grooves. When the structures hereinbefore described, or any of them, is applied to turnpike roads, tram or wheel ways A, A, A, figures 1, 2, drawing No. 5, may be formed. The centre track may be, say, three feet wide, and the outside tracks, say, two feet each.

Metal tramways having a slight concave surface may be laid on to the tracks, and let in flush with the surface level; the form of the block rhomboidal, the angles of which, say, 12° in two of its faces, the angles laying in a line with the line of road, the rods laying in the same line, or in the same line and crossing as in the woven pavement; the
320 parallelism of the tracks maintained by paving-stones or broken stones; the foundation formed by any of the aforesaid foundations. When the aforesaid brick foundation is used, the textile superstructure should be so applied as that the rods 5, 6, 7, 8, figure 2, drawing 3, should cross the centres of the squares that are filled in with earth or stones. On lines of railway, on embankments, or cuttings, where loose soils occur, the textile pavement aforesaid may be applied with advantage in lieu of ordinary ballasting; the railway bars may lay along on the pavement. In order to facilitate the impelling of carriages or trains over ascending planes, I combine, with an inclined plane on a road or railway, a fixed rail or centre rail A, figure
321 1, 2, drawing No. IV, by laying down a continuous sleeper, and may be placed on the ascending tracks of railways.

At the foot of the plane the rail is tapered to a thin section, and gradually increases for one hundred feet. To a locomotive engine or impeller I apply an adhesion apparatus, put in motion by the impelling power of said locomotive. This I construct in the following manner as one method, the principle of which, however, may be varied by any other varied mechanical arrangement:

On the crank-axle of the locomotive-impeller I fix two level wheels, B B, gearing or working into two pinions, C C; these pinions are
322 fixed upon a crutch or frame D D, affixed in any convenient manner to the frame-worth or otherwise of the locomotive. On the axles of the pinions C C I affix two adhesion wheels, E E; these wheels are put in motion by the wheels B B on the crank axle, working in the pinions C C, and these adhesion and bevel wheels must be so arranged as that the peripheries of the adhesion wheels must move through the same space as the driving-wheels of the locomotive. To regulate the pressure or adhesion of the wheels E E upon the inclined sides of the conical rails at A, I affix two levers, F F, attached to the crutch or frame D at the point G, where they cross each other, the point G acting as a fulcrum for both. To the long ends of the levers F F I attach
323 a guide-bar, H, by a movable joint, Q Q. This guide-bar is con-

structed of three parts, the centre being composed of a right and left handed screw, 3 3, working in the nuts 4 of the end-parts K K of the bar H. Upon the centre-part I, I affix a double-ratchet wheel, L, having pauls, 5 5, working in their teeth; these I put in motion by means of the handle M, and so move the ratchet-wheel either way at pleasure.

The ratchet-wheels being fixed to the screws 3 3 will lengthen or shorten the guide-rod H, and hence the long ends of the levers F F will likewise approach each other, and the axles of the adhesion-wheels being permitted to move backwards and forwards, the adhesion-
324 wheels will be brought into contact with the sides of the bar at A, or detached from it at pleasure by the ratchet-wheel handle placed near the engine-driver of the locomotive. When the locomotive approaches the foot of an inclined plane, the bar *b b* entering between the adhesion-wheels and gradually getting under, prevent any shock on the entry of the rail at A. The level wheels B B being put in motion by the engine-motion on the pinions C C, and hence on the adhesion-wheels E E, which will roll on the sides of the conical rail. The adhesion of these wheels on the rail will assist the bite or adhesion of the driv-
325 ing wheels of the locomotive, and enable the engine, by its power, to overcome the gravity of the road when on the inclined plane. When the train reaches the summit of the incline the rail *b b* gradually decreases in width, and is discontinued, and the adhesion-wheels will then approach and roll upon each other. The levers F F are made slightly flexible, to admit of the latteral motion of the carriage. And so I construct an improved locomotive-impeller, which I apply to any kind of locomotive-engine, whether of steam, gaso-pneumatic, or electro-magnetic.

And, further, the better to regulate the working of roads or ways,
326 I combine with said roads or ways self-acting or self-regulating indicators for marking the times of arrivals and departures of carriages or trains at and from stations, by applying as fixtures at or near stations, stamping or printing apparatus, hereinafter described, and applying to locomotive-engines or carriages, apparatus, index or indices, which unite at said stations with said indicators for the purpose of stamping or printing the times of arrival and departure of trains at stations, or the times of the passing of stations by quick trains, on the latter of which is recorded, whilst passing said stations, the time of departure of a preceding train, and which record is made visible to the engine-driver of said passing quick train after he shall have passed station.

327 With that view I form said road or way by combining with it at or near stations, say, within five hundred feet on either side of a station, that shall denote the points of arrival and departure of trains on an up and down line, an indicator of time, A, figure 1, drawing No. VII, I fix a conveniently formed frame, A A, between the tracks of a line of rails, the upper part of the frame being a little above the surface-level. On the side of the railway, near the indicator, I place a common clock, B; from the hour and minute spindles of the clock B I carry pitch-chains to the two circular revolving hour and minute spindles of the dials *b b*, on the line of railway; these pitch-chains move over pitch-pullies on the spindles, and hence the hour and minute
328 spindles of the clock put the revolving hour and minute dials of the indicator in motion, in the same manner and in the same time as the hour and minute-spindles of a clock. These dials form a part of the frustrum of a cone, and placed in such a position as that one of the slanting sides shall be parallel to the horizon.

the vertical face of each block a circular indent 1, 2, 3, 4, 5, 6, drawing No. 1, and figures 1, 2, drawing 3, about five inches broad and
318 one inch deep. Into each of these I put a composition, such as any of the asphaltums mixed with coarse gravel or sand, or what is called artificial granite.

I fill the indentations to a level with the upper faces of the blocks, or, in lieu of the said compositions, I insert into the indents a hard-burnt tile, which I cement by any of the aforesaid compositions.

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When stone blocks are used, the grooves may be either cut in their sides, as in the wooden blocks, or a facing of artificial granite
319 put on and moulded in the form of grooves. When the structures hereinbefore described, or any of them, is applied to turnpike roads, tram or wheel ways A, A, A, figures 1, 2, drawing No. 5, may be formed. The centre track may be, say, three feet wide, and the outside tracks, say, two feet each.

Metal tramways having a slight concave surface may be laid on to the tracks, and let in flush with the surface level; the form of the block rhomboidal, the angles of which, say, 120° in two of its faces, the angles laying in a line with the line of road, the rods laying in the same line, or in the same line and crossing as in the woven pavement; the
320 parallelism of the tracks maintained by paving-stones or broken stones; the foundation formed by any of the aforesaid foundations. When the aforesaid brick foundation is used, the textile superstructure should be so applied as that the rods 5, 6, 7, 8, figure 2, drawing 3, should cross the centres of the squares that are filled in with earth or stones. On lines of railway, on embankments, or cuttings, where loose soils occur, the textile pavement aforesaid may be applied with advantage in lieu of ordinary ballasting; the railway bars may lay along on the pavement. In order to facilitate the impelling of carriages or trains over ascending planes, I combine, with an inclined plane on a road or railway, a fixed rail or centre rail A, figure
321 1, 2, drawing No. IV, by laying down a continuous sleeper, and may be placed on the ascending tracks of railways.

At the foot of the plane the rail is tapered to a thin section, and gradually increases for one hundred feet. To a locomotive engine or impeller I apply an adhesion apparatus, put in motion by the impelling power of said locomotive. This I construct in the following manner as one method, the principle of which, however, may be varied by any other varied mechanical arrangement:

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322 fixed upon a crutch or frame D D, affixed in any convenient manner to the frame-worth or otherwise of the locomotive. On the axles of the pinions C C I affix two adhesion wheels, E E; these wheels are put in motion by the wheels B B on the crank axle, working in the pinions C C, and these adhesion and bevel wheels must be so arranged as that the peripheries of the adhesion wheels must move through the same space as the driving-wheels of the locomotive. To regulate the pressure or adhesion of the wheels E E upon the inclined sides of the conical rails at A, I affix two levers, F F, attached to the crutch or frame D at the point G, where they cross each other, the point G acting as a fulcrum for both. To the long ends of the levers F F I attach
323 a guide-bar, H, by a movable joint, Q Q. This guide-bar is con-

structed of three parts, the centre being composed of a right and left handed screw, 3 3, working in the nuts 4 of the end-parts K K of the bar H. Upon the centre-part I, I affix a double-ratchet wheel, L, having pauls, 5 5, working in their teeth; these I put in motion by means of the handle M, and so move the ratchet-wheel either way at pleasure.

The ratchet-wheels being fixed to the screws 3 3 will lengthen or shorten the guide-rod H, and hence the long ends of the levers F F will likewise approach each other, and the axles of the adhesion-wheels being permitted to move backwards and forwards, the adhesion-
324 wheels will be brought into contact with the sides of the bar at A, or detached from it at pleasure by the ratchet-wheel handle placed near the engine-driver of the locomotive. When the locomotive approaches the foot of an inclined plane, the bar *b b* entering between the adhesion-wheels and gradually getting under, prevent any shock on the entry of the rail at A. The level wheels B B being put in motion by the engine-motion on the pinions C C, and hence on the adhesion-wheels E E, which will roll on the sides of the conical rail. The adhesion of these wheels on the rail will assist the bite or adhesion of the driv-
325 ing wheels of the locomotive, and enable the engine, by its power, to overcome the gravity of the road when on the inclined plane. When the train reaches the summit of the incline the rail *b b* gradually decreases in width, and is discontinued, and the adhesion-wheels will then approach and roll upon each other. The levers F F are made slightly flexible, to admit of the latteral motion of the carriage. And so I construct an improved locomotive-impeller, which I apply to any kind of locomotive-engine, whether of steam, gaso-pneumatic, or electro-magnetic.

And, further, the better to regulate the working of roads or ways,
326 I combine with said roads or ways self-acting or self-regulating indicators for marking the times of arrivals and departures of carriages or trains at and from stations, by applying as fixtures at or near stations, stamping or printing apparatus, hereinafter described, and applying to locomotive-engines or carriages, apparatus, index or indices, which unite at said stations with said indicators for the purpose of stamping or printing the times of arrival and departure of trains at stations, or the times of the passing of stations by quick trains, on the latter of which is recorded, whilst passing said stations, the time of departure of a preceding train, and which record is made visible to the engine-driver of said passing quick train after he shall have passed station.

327 With that view I form said road or way by combining with it at or near stations, say, within five hundred feet on either side of a station, that shall denote the points of arrival and departure of trains on an up and down line, an indicator of time, A, figure 1, drawing No. VII, I fix a conveniently formed frame, A A, between the tracks of a line of rails, the upper part of the frame being a little above the surface-level. On the side of the railway, near the indicator, I place a common clock, B; from the hour and minute spindles of the clock B I carry pitch-chains to the two circular revolving hour and minute spindles of the dials *b b*, on the line of railway; these pitch-chains move over pitch-pullies on the spindles, and hence the hour and minute
328 spindles of the clock put the revolving hour and minute dials of the indicator in motion, in the same manner and in the same time as the hour and minute-spindles of a clock. These dials form a part of the frustrum of a cone, and placed in such a position as that one of the slanting sides shall be parallel to the horizon.

The movable dials have a case and cover, with a small opening on the upper or horizontal side. The cover to this opening is attached to a movable axle, having a spiral spring wound round it, the action of which closes the dial. To the cover is attached a lever, *d*, standing at an obtuse-angle with the handle of the cover *d*, *l*. To the extreme
329 end of the lever *e*, I attach a rod, *f*, having a hook or tooth upon its end at *g*, which catches in the teeth of a ratchet-wheel, *h*; on the axis of the ratchet-wheel I affix a cylinder, *i*.

The movable dials are made of some thin flexible substance, being numbered on both sides by raised numbers of figures, that is to say, on the upper and lower surface. The letters and numbers in the course of their circuit pass under and over ink rollers, and the letters and numbers being raised take the ink as type. Upon a locomotive-impeller, or other vehicle of a train, I affix a circular wheel, D, drawing No. 6, supported in a vertical position by a flexible spring. On the peri-
330 phery of this wheel I put a band of felt or other soft substance and on the outside of it, and affix a band of paper or other substance capable of taking an impression from the numbers on the hour and minute circles of the movable dials; this wheel, which I call the register, I enclose in a case, having an opener in front of it.

Suppose a train approaches the station A in the direction of the arrows, the opener will come in contact with the movable cover on the exposed part of the movable dials, and force it open in the direction of the bent arrow. The register wheel coming directly after, will roll over the letters on the exposed part of the movable dials, and take an impression from the ink or indentation, when stamped, or both; as
331 soon as the wheel has passed over the exposed part of the dials it loses contact, and hence stops in its motion or revolution, and the movable cover, by means of the spiral spring, returns back and covers up the exposed part of the dials. To the same locomotive-impeller, near the seat of the conductor of the train, I attach a vertical wheel, similar in construction to the one already described.

This wheel I call the reporter; the purpose of this wheel is to inform the conductor what time the former train passed. To effect the purpose I pass on an endless band of paper or other substance under the exposed part of the movable dials, and at the moment the regis-
332 ter-wheels pass over the dials, the raised figures on the under side of the dials will be pressed down upon the paper band, and leave the same impression upon it that was left on the register-wheel; but the band must move from under the dials after it has been printed to the point *k*, having a similar cover to that on the dial. I effect this in the following manner.

When the cover of the exposed part of the dials of the indicator is pressed in the direction of the bent arrow, the opposite end of the bent lever will move in the direction of the red arrow. The rod *f* will move along the periphery of the ratchet-wheel *h*, but when the cover returns to its fixed position, after the register-wheel has passed over the
333 indicator, the end of the bent lever will return to its first position, and the hook or tooth of the rod *f* catching one of the teeth of the ratchet-wheel, it will draw round the periphery of the ratchet-wheel a like distance; the cylinder *i* will likewise be drawn round, being fixed upon the same axis or spindle as the ratchet-wheel, and hence draw the paper band forward under the opening, where the reporter passes over it; the paper band passes over a similar cylinder at the opposite side of the railway.

Suppose a train approaches to the station; an opener in front of the

reporter will remove the cover in the direction of the curved arrow, and the reporter, rolling over it, will take an impression from
334 the paper band, the ink of which being of such a nature as will not soon dry. The conductor, without stopping at the station, may see the time the former train *is* passed that station by turning the reporter round. The same action taking place after this train has passed will leave the time exposed to the next train that may pass, which will in like manner receive an impression. In the combination of the indicator with a line of way, I have shewn one simple method of construction, which, however, may be varied by any mechanical means to effect the objects aforesaid. The indicator will also be marked with the name of the station at which it is placed, and will mark a like impression.

335 Having in the foregoing specification set forth and described my method of combining materials, and exhibited the varied applications thereof, I claim the method herein described and shewn in drawing No. I, figures 1, 2, and 3, and in drawing No. III.

I claim the method herein described and shewn in drawing No. II, figures 1, 2, 3, and drawing No. III.

I claim the method herein described and shewn in drawing No. IV.

I claim the method herein described and shewn in drawing No. V.

336 I claim the method herein described and shewn in drawing No. VI.

I claim the method herein described and shewn in drawing No. VII.

In witness whereof I, the said Henry Pinkus, have hereunto set my hand and seal this fifteenth day of April, in the year of our Lord one thousand eight hundred and forty-one.

H. PINKUS. [L. S.]

And be it remembered that on the fifteenth day of April, in the
337 fourth year of the reign of Her Majesty Queen Victoria, the said Henry Pinkus came before our said lady the Queen, in her chancery, and acknowledged the instrument aforesaid and all and every thing therein contained and specified in form above written.

And also the instrument aforesaid was stamped according to the tenor of the statute made in the fifty fifth year of the reign of his late Majesty King George the Third.

Inrolled the fifteenth day of April, one thousand eight hundred and forty-one.

(Here follow diagrams.)

338 *Def'ts' Ex. No.* 14, *E. G. T., S. E., Jan'y* 20, '71.

A. D. 1841. No. 9097.

WOODEN PAVEMENTS.

De Calcina's specification.

To all to whom these presents shall come I, Comte Melano de Calcina, of Nassau street, in the county of Middlesex, send greeting:

Whereas her present Most Excellent Majesty Queen Victoria, by her letters patent under the great seal of Great Britain, bearing date at

Westminster, the twenty-first day of September, in the fifth year
339 of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Comte Melano de Calcina, my ex'ors, adm'ors, and assigns, or such others as I, the said Comte Melano de Calcina, my ex'ors, adm'ors, or assigns, should at any time agree with, and no others, from time to time, and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the town of Berwick-upon-Tweed, my invention of "Improvements in paving or covering roads and other ways or surfaces," in which said letters patent is contained a proviso obliging me, the said Comte Melano de Calcina, by an instrument
340 in writing under my hand and seal, particularly to describe and ascertain the nature of my said invention, and in what manner the same is to be performed, and to cause the same to be enrolled in Her Majesty's high court of chancery within six calendar months next and immediately after the date of the said in part recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear:

Now, know ye that, in compliance with the said proviso, I, the said Comte Melano de Calcina, do hereby declare the nature of my said invention to consist in the following improvements, that is to say:

341 First, in particular forms of wooden blocks, resting on longitudinal and transverse sleepers, prepared and arranged especially for the purpose, and to be applied to the construction of wooden pavement for covering roads, streets, paths, ways, floors, platforms, bridges, or other surfaces, by whatever name places requiring to be paved or covered may be called.

And, secondly, in a mode of fastening portions of the same together in uniform or other masses, when required.

And, in further compliance with the said proviso, I, the said Comte Melano de Calcina, do hereby describe the manner in which my
342 said invention is to be performed by the following statement thereof, reference being had to the drawing annexed, and to the figures and letters marked thereon, that is to say:

Description of the drawing.—Figure 1 is a profile view of a block with its tenon E, of the particular form which I use for my wooden pavement.

Figure 2 is a perspective view of the same block and tenon.

Figure 3 is a side view of the same block with its tenon.

Figure 4 is a view of the same block and tenon cut obliquely for the extremity of the row when it meets the abutment.

343 Figure 5 is a view of a portion of the same block and tenon cut for the same purpose, and adapted for terminating any crooked extremity.

Figure 6 represents in plan three sets of three sleepers, each supposed to be laid across a street of a width to require no more than three, and extending from curb-stone to curb-stone, A A representing the line of curb-stone on each side, and B B longitudinal sleepers for the ends of the outside transverse sleepers to rest upon.

Figure 7 represents a section of figure 6, shewing the angle at which the longitudinal sleepers B B should be cut to receive the ends of the two outside transverse sleepers C C, while the centre transverse
344 sleepers, whether one or more, are notched into the outside sleepers (or into each other when more than one), as shewn in this figure. The sleepers being thus arranged on ground merely laid smoothly to the form required, I commence placing my blocks as shewn

in figure 8, their tenons, which I have marked E in figure 1, passing down between the transverse sleepers, while those parts of the block which project beyond the tenon rest half-way over the transverse sleeper on each side of it, as shewn in this figure.

(Here follows diagram.)

Figure 9 shews a portion of a street or way completely paved with my said improvements; F being the series of blocks covering the surface, B the longitudinal sleepers, and G G the pavement on either side.

Figure 10 is a section of figure 9.

345 In wide streets or extensive surfaces, or where it would be useful to lay the pavement down in masses of given dimensions, I employ my second improvement, which is as follows:

I arrange a portion of the transverse sleepers and blocks, as shewn at figure 11, passing a bolt with screw-nuts through at each end, as shewn at H, the nuts being either let into the sleeper, or, if allowed to project, the tenon of the block being cut away to pass them.

It will be useful here to observe, that when it becomes necessary to take up any portion of a pavement constructed on this plan the first block must be drawn out as follows: A screw-plug with a ring

346 being screwed down firmly into the centre of the block, a simple lever of the first order passed through the ring with its end resting on a distant block is employed to draw it up, and one being removed a lever will easily force up the rest.

Having now described the nature of my said invention, and the manner of carrying the same into effect, it is only necessary further to state that the number of transverse sleepers reaching from abutment to abutment may be varied at pleasure, dependent on the distance from one abutment to the other, as also the size of the scantling of those sleepers, and of the masses, when laid down in masses, by which the

347 surface is to be covered. Nor is it absolutely necessary that the sleepers should be of wood, as metal sleepers in some cases may be preferred. The blocks also may vary in dimensions, and even in the relative proportions of their several parts. The foot-hold also may be accomplished by various transverse or other grooves or cuts in the upper surface of the blocks, which may be also otherwise roughed to obtain the same object. But whereas I claim as my invention, first, blocks with tenons formed in one piece with (which I prefer) or made separately and added to the block, such tenons being forced firmly between sleepers on which the blocks rest, as hereinbefore described; and, secondly, in the union of such sleepers

348 by bolts and screw-nuts, or other fastenings, so as to form, when the blocks with their tenons are inserted, masses of blocks of such given dimensions as may be required; both my said improvements being for the purpose of paving or covering roads and other ways or surfaces, such improvements enabling me to pave, floor, or cover with more firmness, more facility of removal, and less labor than the modes now in use, and without the necessity of any expensive foundation for the sleepers or tenons of the blocks to rest upon. And such my invention being, to the best of my knowledge and belief, entirely new,

349 and never before used within that part of Her said Majesty's United Kingdom of Great Britain and Ireland called England, her said dominion of Wales, or town of Berwick-upon-Tweed, I do hereby declare this to be my specification of the same, and that I do verily believe this my said specification doth comply in all respects

fully, and without reserve or disguise, with the proviso in the said hereinbefore in part recited letters patent contained; wherefore I hereby claim to maintain exclusive right and privilege to my said invention.

In witness whereof I, the said Comte Melano de Calcina, have hereunto set my hand and seal this twenty-first day of March, one
350 thousand eight hundred and forty-two.

COMTE MELANO DE CALCINA. [L. S.]

And be it remembered that on twenty-first day of March, in the year of our Lord 1842, the aforesaid Comte Melano de Calcina came before our said lady the Queen, in her chancery, and acknowledged the specification aforesaid, and all and everything therein contained and specified, in form above written.

And, also, the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

Inrolled the twenty-first day of March, in the year of our Lord one thousand eight hundred and forty-two.

FARRER.

351 *Def'ts Ex. No. 15.—E. G. T., S. E., Jan'y 20, '71.*

A. D. 1842. No. 9410.

WOOD PAVING.

Perring's specification.

To all to whom these presents shall come, I, John Perring, of Cecil House, 85 Strand, in the city of Westminster, hat-manufacturer, send greeting:

Whereas Her present Most Excellen' Majesty Queen Victoria, by her royal letters patent, under the great seal of Great Britain, bearing date at Westminster, the seventh day of July, one thousand eight hundred and forty-two, in the sixth year of her reign, did for herself, her hiers and successors, give and grant unto me, the said John Perring, my ex'ors, adm'ors, and assigns, her especial license, full power, sole privilege and authority, that I, the said John Perring, my ex'ors, adm'ors, and assigns, and such others as I, the said John Perring, my ex'ors, adm'ors, and assigns, should at any time agree with, and no others, from time to time, and at all times thereafter during the term of years therein mentioned, should and lawfully might make, use, exercise, and vend, within that
352 part of the United Kingdom of Great Britain and Ireland called England, her dominion of Wales, and town of Berwick-upon-Tweed, and also in all Her Majesty's colonies and plantations abroad, my invention of "improvements in wood paving," partly communicated by a foreigner residing abroad; in which said letters patent there is contained a proviso obliging me, the said John Perring, to particularly describe and ascertain the nature of my said invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, and cause the same to be inrolled in Her said Majesty's high court of chancery within six calender months next and immediately after the date of the said in part recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear:

Now, know ye that, in compliance with the said proviso, I, the said John Perring, do hereby declare the nature of my said invention, and

in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, and by the drawings therein referred to and hereunto annexed.

353 1. Figure 1 is a side view or elevation of a course of four blocks cut across the grain to a mitre or angle of 45 degrees with their surfaces.

2. These blocks I pin or peg together at the centres of their sloped sides, as marked, *a a*, and at the centres of their vertical sides, as marked, *b b*, by pegs or pins placed at the points of intersection of lines drawn diagonally across the sloped and vertical sides. And it is an essential feature of this part of my improvements in wood paving that the blocks should be connected together by pegs or pins situate as nearly as possible at the centres of their sloped and vertical sides.

3. Figure 2 is a plan of four courses of blocks, each alternate course inclining from channel to channel, or from one side of the road to the other, in opposite directions, in which the central connections are also shewn by the dotted lines *a* and *b*.

4. By this arrangement the joins or joints, both at the upper and under surface of the blocks, will be broken or bonded throughout in the direction of the line of traffic, and when one plane or surface becomes
354 worn the other may be brought into use. The surfaces may be grooved in any convenient manner.

5. When the blocks are to be laid upon a concrete or other artificial substratum in a place where the traffic is considerable, I make them 6 inches in depth, and the pins or pegs not less than 1 inch in diameter. The channel-blocks, which are formed of 2 courses of blocks united as before described, should be 1 inch shallower that the blocks for the carriage-way.

6. Although any required area of carriage-way may be covered with blocks from channel to channel, and in the direction of the line of traffic, in a perfectly united mass, yet it is in most cases desirable, for the greater facility of the laying down, removing, and replacing of the blocks, that they should be pinned or pegged together in slabs or masses, say of from 16 to 24 blocks each. And in commencing to lay these slabs or masses down, the blocks must be cut off as in the line of A B, so as to abut firmly against the channels, and to agree with the curve of the carriage-way in the line of traffic.

7. It will be obvious the blocks will be best united at their sloped sides first, and then course by course at their vertical sides.

8. I cut the blocks from squared timber, having the core as nearly as possible at the centre. Supposing the timber to be 6 inches
355 square, I cut it at distances of 6 inches, measured perpendicularly between the planes of the sections, so that when the block is placed in its proper position in the paving the vertical depth of the block will be equal to the depth of the timber as it lies horizontally prepared for cutting, that is, equal to the distance *z z*, measured at right angles to the sloped sides, my rule being that the vertical depth of the block shall be equal to or not less than the distance measured at *z z*.

9. If the blocks are cut of the dimensions and at the angle above described, the pressure on the outer or younger and weaker fibres will be supported in a vertical line by the central and stronger fibres of the wood, and a similar advantage will attend the use of timber cut at angles less than 45, such as any angle between 40 and 45, provided the same dimensions of block be used. And I consider the adoption of some angle between 40 and 45, with the dimensions above mentioned, an important feature of my invention, as it enables me to use compara-

tively young or open-grained timber; since in blocks cut of the dimensions and at the angles above mentioned there will be no part of
356 the more tender fibre which is unsupported in a vertical line by that which is harder. I claim, as part of this my invention, so far as the same is stated in the above paragraphs, firstly, the improvement in wood paving, whereby the blocks are cut and placed so that the central or stronger fibres shall always assist in supporting the external or weaker fibres, whereby also the blocks are arranged so as to break joint and be bonded together continuously throughout at both surfaces, and whereby also the blocks are pegged together at the centres of both their vertical and sloped sides. And I claim, secondly, as of my invention, the improvement in wood paving whereby the blocks are pinned or pegged together by pins or pegs at the centres both of their sloped and vertical sides, in the manner described, at whatever angle the blocks may be cut.

10. Figure three is a side view or elevation of a course of four blocks cut across the grain at an angle of 80 degrees with their surfaces.

Figure four is a plan of 4 courses of such blocks, each alternate course inclining from channel to channel, or from one side of the road to the other in opposite directions. These blocks are pinned or
357 pegged together in a central line, intermediate between the two surfaces, at their vertical sides only, by pins or pegs marked *c c*.

11. The observations in the paragraphs marked 4, 5, 6, and 8, as applicable 5 to figures 1 and 3, are also applicable to figures 3 and 4.

12. In wood paving constructed of blocks cut at the angle of 80°, the principle before adverted to, of having the external or weaker fibre supported by the central or stronger fibres, does not exist in the same manner as in blocks cut at angles of from 40° to 45°, since the fibres of the blocks cut at an angle of 80° will deviate only 10 degrees from the vertical, and consequently it is necessary to use older and closer-grained wood or timber of such a size that the blocks cut from it shall have their fibres of nearly as possible uniform strength throughout. If the wood be of the best quality as to fibre, I prefer cutting the timber at an angle of 80°, but if the timber be not of the best quality, a somewhat smaller angle may be adopted with advantage, and the angles may range from 75 to 80 degrees. I claim as my invention, so far as the same is
358 stated in the above paragraph' 10, 11, and 12, firstly, the improvement in wood paving whereby blocks cut at angles varying from 75 to 80 degrees are united together by pegs at their vertical sides, as above described; and, secondly, the improvement in wood paving, by the use of two pegs on the central line, as above described, of the vertical sides, whatever the angle of the blocks.

13. Figure 5 is a modification, in which the blocks incline in the same direction from side to side of the carriage-way. The joins or joints are broken or bonded alike throughout at both surfaces, and the blocks are connected together in a central line intermediate to the two surfaces at their vertical sides only by pins or pegs marked *d d*. Figure 6 is an elevation of four of these blocks.

14. Figure 7 is a modification in which the blocks incline in the same direction lengthwise of the carriage-way. The joins or joints in this modification are broken or bonded throughout at both surfaces; but the blocks are connected together in a central line intermediate to the two surfaces at their sloped sides only by pins or pegs marked *e e*. Figure 8 is an elevation of four of these blocks.

In the modification, figure 5, where the pavement is laid down in slabs or masses, I prefer that they should be occasionally keyed

359 at the sides by the intersection of projecting blocks with the adjoining slabs or masses, so that they may be kept steady in their places, and in the modification, figure 7, it will be advisable, when laid in slabs or masses, so to let them intersect each other that the joins or joints of the slabs or masses may also be broken from side to side of the carriage-way.

16. A peculiar advantage of these two modifications, as shewn in figures 5, 6, 7, and 8, consists in the facility with which any number of slabs or masses may be removed and replaced.

17. The observations in the paragraphs numbered 4, 5, 6, and 8, as applicable to figures 1 and 2, are also generally applicable to figures 5, 6, 7, and 8. I claim as of my invention, so far as the same is stated in paragraphs 14, 15, 16, and 17, the improvements in wood paving consisting in the modifications of arrangement and connection therein described.

18. Figure 9 is a side view or elevation of a course of four blocks, having slips of wood attached to them of about one inch in thickness, and coming to within about one inch of the upper and lower sur-
360 faces of the blocks, either of which surfaces may be placed upwards. Figure 10 is an end view of a block having such a slip of wood attached; and figure 11 is a plan in which 16 blocks are united by pegs, *f*, on the sloped sides, and by pegs, *g*, on the vertical sides, and having such slips of wood arranged between the courses and in a direction transverse to the line of traffic. Slips of wood may also be fixed by similar means to the sloped sides of the blocks, although not shewn in the drawing.

19. These slips of wood are for the purpose of separating the blocks so that a sure foothold may be afforded to horses and other animals without reducing the substance of the blocks. It is desirable that in these slips the fibre or grain of the wood should run horizontally, and it will be generally found that they can be made from the comparatively waste material formed in squaring the wood in the manufacture of the blocks, by which a considerable saving can be effected in the cost of the wood pavement.

20. Figure 12 is a plan of four courses of blocks connected together at their vertical sides by pins or pegs marked *g*, and held together
361 in a transverse direction by the slips of wood marked *h*, which slips of wood, instead of being separated at the sloped line of junction between each block, run the full length of the course of blocks. Figure 13 is a side view or elevation of four blocks thus connected. I prefer having the holes in the slips of wood for this purpose as much larger than the circumference of the pins or pegs as will admit of a little play, so that each mass or slab may take the required curve across the carriage-way.

21. The slips of wood on the outer sides of each mass or slab may be of half the thickness of those at the inner sides of the blocks, but if used as laid down in the drawing. the blocks at the side, not connected by a slip of wood, may be held together by iron cramps.

22. The observations contained in the paragraphs numbered 4, 5, 6, 7, and 8, as applicable to figures 1 and 2, are generally applicable to figures 9, 10, 11, 12, and 13.

23. But I must here remark that where the wood paving is to be laid on an inclined plane I prefer increasing the number of interstices formed from channel to channel by the application of slips of wood in
362 the manner already described, reducing thereby the thickness of

the block in the direction of the line of traffic, and thus still further securing the foothold.

24. It will be obvious that other elastic substances besides wood may be used between the blocks, but I believe none will be found so economical as wood.

I claim as my invention, so far as the same is stated in paragraphs 18, 19, 20, 21, 22, 23, 24, the improvement in wood paving by the use of slips of wood or other elastic substances between blocks, of whatever shape, for the purpose of affording a secure foothold.

In witness whereof I, the said John Perring, have hereunto set my hand and seal this seventh day of January, in the year of our Lord one thousand eight hundred and forty-three.

JNO. PERRING. [L. S.]

And be it remembered that on the seventh day of January, in the year of our Lord 1843, the aforesaid John Perring came before our said lady the Queen, in her chancery, and acknowledged the specification aforesaid, and all and everything therein contained and specified,
363 in form above written. And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

Enrolled the seventh day of January, in the year of our Lord one thousand eight hundred and forty-three.

DREW.

(Here follows diagram.)

354 *Def't's Ex. No.* 16.—*E. G. T., S. E., Jan'y* 20, '71.

A. D. 1842. No. 9266.

WOODEN PAVEMENTS AND HORSES' SHOES.

Reynolds's specification.

To all to whom these presents shall come, I, Osborne Reynolds, of Belfast, in the kingdom of Ireland, clerk, send greeting.

Whereas Her present Most Excellent Majesty Queen Victoria, by her royal letters patent under the great seal of Great Britain, bearing date at Westminster, the twenty-fifth day of February, in the fifth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Osborne Reynolds, her especial license, full power, sole privilege and authority, that I, the said Osborne Reynolds, my executors, administrators, and assigns, and such others as
365 I, the said Osborne Reynolds, my executors, administrators, or assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein mentioned, should and lawfully might make, use, exercise, and vend, within England, Wales, and the town of Berwick-upon-Tweed, my invention of "certain improvements in covering streets, roads, and other ways with wood, and also in the means of enabling horses and other animals to pass over such roads and other slippery surfaces with greater safety than heretofore;" in which said letters patent is contained a proviso, obliging me, the said Osborne Reynolds, by an instrument in writing under my hand and seal, particularly to describe and ascertain the na-

ture of my said invention, and in what manner the same is to be
366 performed, and to cause the same to be enrolled in Her Majesty's high court of chancery within six calender months next and immediately after the date of the said in part recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear:

Now know ye that, in compliance with the said proviso, I, the said Osborne Reynolds, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the following description thereof, reference being had to the drawings hereunto annexed, and to the letters and figures marked thereon, that is to say:

My invention of certain improvements in covering streets, roads, and other ways *ways* with wood, and in the means of enabling horses
367 and other animals to pass over the same with greater safety than heretofore, may be divided into two parts, and consists,

Firstly. In various improvements upon a former invention, for which I obtained a patent on the twenty-seventh April, one thousand eight hundred and forty-one, for improvements in paving streets, roads, and ways; and, secondly, in a novel method of making the shoes of horses and other animals, to prevent them from slipping, and giving them a firmer hold on the pavement.

In order to form a firm, compact, and cheap paving, I first level the ground and ram it hard, covering it also with sand, if desirable. Upon this I lay boards, planks, beams, laths, or slips of wood, either in close contact or with any intervals between them; and upon these
368 boards so arranged I place blocks of wood of any form. The forms of blocks which I prefer are parallelopipedons, or other figures, such as may be formed by one cut, either oblique or perpendicular to the grain of the wood, from a plank of any breadth, and of any thickness, not exceeding four inches. I also use blocks formed similarly from round or unhewn timber. If desirable, I place a second or even a third layer of boards on the first, imbid them wholly or partially in cement, nail or otherwise fasten them together. If desirable, I intersperse between those sides of blocks which are in contact a few grains of gravel or other hard substance not smaller than spheres whose diameter is one-twentieth of an inch, so that these grains may be partially imbedded in each of two adjacent sides, and thereby strengthen their mutual support.

369 To make the pavement water-tight I surround the blocks, when desirable, with cement; and to unite the whole compactly together I secure the blocks to the foundation planks, or to each [here follows diagram] other or both, by nailing or pinning each block to the mass already formed. This method of fastening the blocks together is obviously different from any of the methods hitherto employed of securing a number together by means of pegs, pins, or dowels.

To roughen the surface I scatter upon it by the hand or other instruments gravel or broken stone, screened so as to contain neither dust nor sand, nor grains of any size less than that described above. I scatter this gravel in any quantity, not exceeding four pounds avo'rdupois to the square yard. This operation I repeat often enough to keep the surface constantly rough. This repetition, combined with the
370 use *use* of grains of a proper size, alone produces the whole effect desired, without the accumulation of mud or dust, which always accompanies the use of gravel as it has been hitherto employed for this purpose.

The second part of my invention consists in forming bars, ribs, or projections on that part of the under side of horseshoes which is between the toe and the caulk, for the purpose of preventing horses from slipping.

Figure 1 in the accompanying drawing represents the under side of a horseshoe constructed in this manner; and

Fig. 2 is a side view of the same; *a a a a* are the bars, ribs, or projections formed on the under side of the shoe; *b b b* are three ribs which form the toe of the shoe. I do not intend to confine myself to the precise arrangement herein shown, as it may be varied without departing from the nature of my invention.

371 Having now described my invention and the manner of carrying it into effect, I claim—

Firstly. The method herein described of using boards for a foundation of wood pavement; also the use of blocks of the forms described, together with the modes described of strengthening the whole by means of hard grains of gravel and nails of iron or pins of wood; and, further, the method described of roughening the surface continually by gravel or broken stone.

Secondly. I claim the improved method herein shown of constructing the shoes of horses and other animals, whereby they are prevented from slipping as above described.

In witness whereof I, the said Osborne Reynolds, have hereunto set my hand and seal the twenty-second day of August, in the year of our Lord one thousand eight hundred and forty-two.

OSBORNE REYNOLDS. [L. S.]

372 And be it remembered, that on the twenty-second day of August, in the sixth year of the reign of Her Majesty Queen Victoria, the said Osborne Reynolds came before our said lady the Queen in her chancery, and acknowledge' the instrument aforesaid and all and everything therein contained and specified, in form above written.

And also the instrument aforesaid was stamped according to the tenor of the statute made in the fifty-fifth year of the reign of His late Majesty King George the Third.

Inrolled the twenty-fifth day of August, one thousand eight hundred and forty-two.

CUNNINGHAM, *Extra.*

373 *Def't's Ex. No.* 17.—*E. G. T., S. E., Jan'y* 20, '71.

A. D. 1842. No. 9443.

PAVING ROADS.

Poole's specification.

To all to whom these presents shall come, I, Moses Poole, of Lincoln's Inn, in the county of Middlesex, gentleman, send greeting:

Whereas her present Most Excellent Majesty Queen Victoria, by her letters patent under the great seal of Great Britain, bearing date at Westminster, the eleventh day of August, in the sixth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Moses Poole, her especial license, full power, sole privilege and authority, that I, the said Moses Poole, my ex'ors, adm'ors, or
374 assigns, or such others as I, the said Moses Poole, my ex'ors,

adm'ors, or assigns, should at any time agree with and no others, from time to time and at all times during the term of years therein expressed should and lawfully might make, use, exercise, and vend, within England, Wales, and the town of Berwick-upon-Tweed, the invention of "improvements in paving or covering roads and other ways," communicated to me by a certain foreigner residing abroad; in which said letters patent is contained a proviso that I, the said Moses Poole, shall cause a particular description of the nature of the said invention, and in what manner the same is to be performed, to be enrolled in Her said Majesty's high court of chancery within six calendar months next and immediately after the date of the said in part recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

Now know ye that, in compliance with the said proviso, I, the said Moses Poole, do hereby declare that the nature of my said invention and the manner in which the same is to be performed are fully described and ascertained in and by the following statement thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon, that is to say:

In order to form a good pavement for the public roads that will be economi*ed* and yet last a considerable time, it is necessary that there should be a sol'd base, at the same time one that is permeable; that there should be a perfect cohesion and solidity of all the parts of which the pavement is composed, in order that it may resist the pressure which is exercised upon it by the weight of carriages passing over it, and also to allow for the expansion which takes place from the damp and from the effect of the frost; and further, that the mode of joining the parts together should be easy and expeditious; that the pavement may be easily and readily removed, without any waste, when required for the repairs of the sewers, or for laying down the pipes for water or for gas; and further, that the surface should be of such a nature as to form a firm footing for the feet of horses so as to prevent them from slipping, and also prevent the wheels from forming ruts in the roads; also, that the fibres of the wood should be placed in a particular direction, which is of very great benefit for the duration of the pavement.

The improvements in wood-paving, which will be afterwards described, offer many advantages which will be pointed out.

I would observe that the whole of the conditions above described to form a good pavement are not required in every description of pavement, but only in those of the public ways. This observation is necessary in order to explain why a different description of different pavement is given. The figures 1, 2, 2^1, and 7, 8, 9 represent different solids or forms of blocks.

The solid or form of blocks, figure 1 1′, is a quadrangular prism, inclined two ways, the base of which is a right angle, *a*, *b*, *c*, *d*, or *a′*, *b′*, *c′*, *d′*, rising parallel to itself in the diagonal direction *d*, *b*, for a row of blocks, and in opposite diagonal direction, *c′*, *a′*, for the following row, and so on alternately changing the row, as shown at figures 3, 5, 6, 10, 11, 12, 13, 14, 17, 18, 19.

The solid or block shown at figures 2, 2^1, is a quadrangular prism, inclined in two ways, the base of which is a rhomboid, *e*, *f*, *g*, *h*, or *e′*, *f′*, *g′*, *h′*, rising parallel to itself, and obliquely in a diagonal direction *g*, *e*, for a row, and in the opposite direction *h′*, *f′*, for the following row, and thus alternately changing the rows, as shewn at figures 20, 21.

The figure 4 shows an arrangement of the row of blocks of the form shown at figure 2 and the following row of a similar form, but the rhomboid of which has equal opposite angles; that is to say, the two acute angles become obtuse and the two obtuse angles become acute, and they are thus placed alternately row for row, as shewn at figure 2[1].

These several blocks are so arranged that they incline and press one upon another in two ways; that is to say, the front always in the same direction, and by their sides alternately from row to row, from left to right, and right to left, as shewn at figures 4, 3, 5, 6, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21.

The solid or block of which the pavement is constructed, shown at figures 7, 8, 9, is a quarangular prism, the base of which is a
379 right angle, rising perpendicularly and parallel to itself.

This form of pavement may be advantageously placed under large gateways or courts, or other places less frequented by heavy carriages. I prefer to have the blocks of oak instead of fir, as they absorb considerable less moisture.

The double obliquity of these blocks, already spoken of, is of great assistance in obtaining that solidity of the whole pavement, the means of doing which we shall afterwards describe, at the same time it greatly assists the elasticity of the fibres of the wood, which is very necessary to the preservation of paving in the public ways. The triple obliquity of the blocks, figures 4, 20, 21, procures the lateral inclination of the joints in a diagonal way, relative to the direction of the road, which reduces the injurious effect of the wheels which pass over the joints in
380 their length when they are presented parallel to the line of the way or road.

Before laying down the pavement the ground should be properly prepared by levelling, and in some cases, where a great solidity is required, I put down a quantity of oak lathes, placed and confined over each other, the open spaces between which should not exceed the base of the block. This should be covered with a layer of gravel or earth, which should be well beaten down. The expense of this mode of preparing the foundation will not be found so great as a foundation of concrete, and it will be less difficult when required to be taken up for the opening of the sewers, or for the laying down gas or water pipes.

Another advantage of this system over the concrete is, that after the concrete is put down, it requires some days before it is of a
381 proper consistency to have the pavement put down, and in case of the pavement requiring repairing, the materials taken up may be again used. The bands or tongues which connect or tie together the different blocks are of different characters.

Those shewn at figures 7, 8, 9, 12, 13, 14, 15, 16, and marked *l*, *m*, *n*, are simple supports, resting upon the ground, and which are sunk a small distance in the ground. Some of the blocks have grooves in them, which fit into them and tie or connect them together.

The others, shown at figures 3, 5, 6, 10, 11, and marked *i*, *j*, *k*, serve not only as supports, but as a means of fixing them together and retaining them downwards by their respective sides, so that they will resist the expansion caused by dampness.

These blocks rest, not only upon these different bars with which
382 they are connected by their sides, but they press also upon the area, by resting upon the lower surface. The tongue-pieces, O, shewn at figures 4, 17, 18, 19, 20, 21, are placed in such manner that the one-half fits into one row of blocks and the other half into another, the blocks having suitable grooves or recesses made therein. It will read-

ily be seen by this arrangement that the whole will be tied together in a very solid manner.

The mode of paving shewn at figures 4, 20, 21, has three tongue-pieces, placed in parallel lines, as shown at O.

These tongue-pieces may be of any required length, or they may be so arranged with short pieces sloping at the end so as to join in the centre of the blocks, as shewn at figures 4, 9, 10, 14, 15, 16, 17, 19, 20, 21.

383 The mode of paving shewn at figures 12, 13, 14, in which is shewn the section of the parts *m*, and the corresponding one of the blocks is exposed, which would take away a portion of the solidity of the pavement.

To remedy this, each block has a pin, which passes through the preceding block, and the end of this pin passes into the ground upon which the pavement is laid, and the great number of these pins which hold the different blocks together, render the whole pavement very solid.

The mode of paving shewn at figures 7, 8, 9, in which the blocks are of a rectangular form in every way; they are not supported or retained by these pieces on which they rest, which pieces are also of a rectangular form, but the solidity is obtained by means of tongue-pieces *q*, which fit into grooves in the blocks, and which, to connect the blocks together, are so arranged that one-half of the tongue-piece is placed

384 in one block and the other half in the next one, which way they are tied together. The different form of blocks described in figures 1, 2, 2^1, 7, 8, 9, may be connected together by any of the descriptions of bands or tongue-pieces marked *i*, *j*, *k*, *l*, *m*, *n*, *o*, *p*, and the form of them may be varied as required, as also, in place of being made of wood, they may be made of plates of iron. I have not thought it necessary to give every size of which the blocks are made, as they may be increased or diminished, but the form of them is given at figures 1, 2, 2^1, 7, 8, 9, the principle of these different systems being based in a general manner upon the use of blocks of wood of the particular angle which they are intended to be laid upon, supported and fixed together by means of the pins fixed in the ground, in whatever number and manner they are fixed.

385 The mode now in use, of making the grooves along and across the pavement, for the prevention of the horses slipping, does not altogether produce the desired effect, but often is the cause of ruts being formed lengthwise in the pavement. In figure 19, I have shewn a mode of forming grooves in the surface of the blocks, crossing in two diagonal directions to the road, which will be found to obviate these objections. This mode of grooving will be more advantageous where the joints of the different blocks are in a diagonal direction, as shewn in figures 4 and 21, than when the joints are lengthways, but the same results may be obtained with the mode shewn at figures 10, 14, 15, 16, in making them diagonal, according to the line *r*, figure 10, or the reverse line *s*, figure 14.

Figures 15 and 16 shews a mode of using blocks of different description of wood of different natures, such, for instance, as fir o' *ack*. The

386 hardness and porosity of these woods being different, the slipperiness would not be so great as if the blocks of wood were all of the same character. These may be laid down, row by row, of each sort, or part of row may be one sort and part of another, and the blocks may be of different sizes.

This arrangement will be found useful for steep places.

The different systems of paving which have been described may be

readily removed, block by block, when so required. They may be also put down in large pieces, the separate blocks having been previously put together.

The mode shewn at figures 4, 17, 18, 19, 20, 21, offer great facilities, which may be done by a nail fixed to each block, the four tongue-pieces which surround the pieces which are composed of a number of blocks joined togther.

These pieces may remain thus tied together, and if it is required to take up the pavement for repairing or other causes, the whole of these pieces may be taken up at one time.

387 This mode of connecting the blocks together will be found to increase the solidity, the paving over a greater surface, and the capability of taking up the paving will be much increased, and the time required for that purpose much decreased. In arrranging the different modes of paving I employ a key-block, the form of it being truncated, as shewn at *t*, figures 8, 10, 11, in the part near the blocks, which prevents them rising by their connection with the bands and tongue-pieces which contain them. These key-blocks are fixed by means of a key, which enters under one of the adjoining blocks, as may be seen in figure 18, in which the head of key-block *v* has passed quarter of a revolution under the joining-block *x*.

By means of a key at T, the square adapts itself to the square of the said key. The head of the key may also be placed under the band, which is close to it at *r*, figure 12. The blocks shewn at 12, 13,

388 14 are rendered solid by means of the pins *p p p* with which they are furnished. In the key-block this pin *p* may be suppressed. They may be fixed by the key *v*, as has been before described.

Another mode of taking up the parts of the pavement without the use of the key-blocks is by the employment of pieces of wood or stone placed lengthwise of the gutters, as shewn at *z*, figures 20, 21, and against which the paving presses; and in order to take up the pavement it will only be necessary to take up these side pieces, when the blocks may be readily removed.

In witness whereof I, the said Moses Poole, have hereunto set my hand and seal this tenth day of February, in the year of our Lord one thousand eight hundred and forty-three.

MOSES POOLE. [L. S.]

389 And be it remembered that on the tenth day of February, in the year of our Lord 1843, the aforesaid Moses Poole came before our said lady the Queen, in her chancery, and acknowledge' the specification aforesaid, and all and everything therein contained and specified, in form above written.

And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

Enrolled the eleventh day of February, in the year of our Lord one thousand eight hundred and forty-three.

SENIOR.

(Here follows diagram.)

390 *Defendant's Ex. No.* 18, *E. G. T., S. E.—Jan'y* 20, '71.

A. D. 1842.—No. 9250.

WOOD PAVEMENTS.

Harlow's specification.

To all to whom these presents shall come: I, Frederick Harlow, of Rotherhithe, in the county of Surry, carpenter:

Whereas Her present most excellent Majesty Queen Victoria, by her letters patent, under the great seal of Great Britain, bearing date at Westminster, the ninth day of February, in the fifth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Frederick Harlow, her especial licence, full power, sole privilege and authority, that I, the said Frederick Harlow, my exo'rs, adm'ors, and assigns, or such others as I, the said Frederick Harlow, my ex'ors, adm'ors, or assigns should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the town of Berwick-upon-Tweed, my invention of "improvements in paving or covering roads and other surfaces, and in machinery for cutting the materials to be used for those purposes," in which said letters patent is contained a proviso that I, the said Frederick Harlow,
391 should cause a particular discription of the nature of my said invention, and in what manner the same is to be performed, to be inrolled in her said Majesty's high court of chancery within six calendar months next and immediately after the date of the said in part recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

Now know ye that, in compliance with the said proviso, I, the said Frederick Harlow, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the drawings hereunto annexed, and to the figures and letters marken thereon, that is to say:

My invention relates, first, to a mode of combining and sustaining the various blocks of wood of which a pavement of a road or a footpath is formed, by the application of grooves and tongues in the manner hereinafter explained.

And, secondly, my invention relates to a machine for forming grooves in blocks of wood used for paving roads and other surfaces, in order to receive tongues, according to the first part of my invention, and
392 also for forming grooves in order to give horses or other animals a better foot-hold. And in order that my invention may be most fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

Description of the drawings.—Figure 1 represents the section of a roadway, with footpaths.

Figure 2 is a plan of the parts shown in figure 1; *a a a* are the blocks of wood of which the roadway is composed, the grain of the wood being vertical; *c c* being tongues, which are received in grooves formed in the blocks of wood *a a a*, and the ends of these tongues *c c* enter into grooves formed in the gutter blocks *d d*; the two gutter blocks *d d*, on each side of the roadway, being combined together by tongues, *e e*, in a direction longitudinally of the road, as is clearly shown. By these

arrangements—combinations of grooves or tongues—the roadway will be retained very equal on the surface, as no single block can descend, each block being sustained by other blocks by means of the tongues, as shown and explained.

I would here remark that figure 1 shows the blocks in a vertical or nearly vertical position, but this is not a necessary position, as the blocks may be caused to incline, and have my invention applied thereto.

393 Figure 3 shows the section of a roadway having the blocks inclining; one row of blocks across the road inclining in one direction, and the next row inclining in an opposite direction, as will readily be traced in the drawings. And it should be stated that my invention does not consist in any peculiar form of block, but of a mode of combining and sustaining blocks of wood by means of grooves and tongues, as herein explained; *f f* are the curb-stones; *g g* show the blocks of wood covering the footpaths, the grain being upwards, and such blocks are combined together by means of tongues and grooves, *h h*, as is shown, and such tongues, *h*, may be of metal or wood; they are shown to be of hoop-iron let into saw cuts or narrow grooves. The tongues of the roadway I make of oak or it may be of other wood.

Figure 4 show' various views of the blocks of wood employed in constructing the roadway, figure 1.

Figure 5 shows part of a longitudinal section of the roadway.

394 Figure 6 shows three views of a block of wood having the means of fastening a single block, which may become necessary in the event of having to remove one from the roadway in order to mend a water or other pipe.

This block has a hole formed through it, into which two plugs, *i i*, and when the block is introduced into its place a wedged plug, *j*, is driven in a vertical hole in the block, by which means the ends of the plugs *i i* will be forced out beyond the sides of the block and enter the grooves in the two blocks which come next to it, as shown by dotted lines in figure 5.

I would remark that although it is desirable to have the tongues *c c* of one piece from side to side of the road, that is not absolutely necessary, as each tongue may be in several lengths; but, in making a tongue in lengths, the ends should not come where the blocks *a a* meet, but the ends of the tongues should both be received by the same block of wood *a a*.

Figure 7 shows three views of inclined blocks separately, which are used in the paving or covering the roadway, figure 3; and it should be stated that although a particular angle is shown, the angle of inclination may be varied.

I will now describe the second part of my invention:

395 Figure 8 shows a plan, figure 9 a transverse section, figure 10 a longitudinal section, of my machine for cutting the grooves; figure 11 shows one of the rotary cutters employed for making grooves on the upper surfaces of blocks of wood used for paving roads, in order to obtain a good foot-hold for horses. The machinery is so fitted up as to perform the two operations, though the parts, if preferred, may be put in separate framings and constitute two machines. *k k* is the framing; *l* is the axis, which receives motion by an endless strap driven by a steam-engine or other power acting on the drum *m*, affixed to the axis *l*, as is shewn. *n* is the rotary cutter which cuts the grooves to receive the tongues *c c*. This rotary cutter consists of the frame *n n*, the nature of which is clearly shown in the drawing, it having the cutting-blades

o o, which form the sides of the grooves, and also the cutters *p p*, which remove the wood from the grooves. Q is the rotary cutter which makes the grooves for the upper surfaces of the blocks of wood used in paving roads and such like surfaces. This rotary cutter consists of the
396 frame having the cutting-blades *r*, as is shown.

A quick rotatory motion is given to these cutters *n q*, and blocks of wood are slides on the surfaces *s t*, through which the cutters respectively work, as is shown; *v* and *w*, being gauge-surfaces which can be adjusted by the set-screws *x x*, and thus enable a workman to cut the grooves in a succession of blocks, so as accurately to combine when tongues *c c* are inserted in such grooves; and the workman can also form grooves in the upper surfaces of blocks of wood used for paving purposes in such positions as he may desire. I would remark that I do not make any claim to the parts of the machinery separately.

Having thus described the nature of my invention and the manner in which the same is to be performed, I would have it understood that what I claim is—

First, the mode of applying tongues and grooves to combine and sustain blocks of wood used in paving roads and such like ways.

And secondly, I claim the mode of combining rotatory cutter *n q* with surfaces *s t* and gauge-surfaces *v w* suitably for forming grooves
397 to receive tongues in blocks used for wood pavements, and for forming grooves on the upper surfaces of wood blocks used for paving roads as above described.

In witness whereof I, the said Frederick Harlow, have hereunto set my hand and seal this 16th day of February, one thousand eight hundred and forty-two.

FREDERICK HARLOW. [L. S.]

And be it remembered that, on the sixteenth day of February, in the year of our Lord 1842, the aforesaid Frederick Harlow came before our said lady the Queen, in her chancery, and acknowledged the specification aforesaid, and all and everything therein contained and specified, in form above written.

And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

Inrolled the ninth day of August, in the year of our Lord one thousand eight hundred and forty-two.

ROSE.

[Here follow two diagrams.]

398 *Def't's Ex. No.* 19.—*E. G. T., S. E., Jan'y* 20, '71.

A. D. 1843. No. 9737.

WOOD PAVEMENTS, FLOORINGS, AND VENEERS.

Austin's specification.

To all to whom these presents shall come, I, Henry Austin, of No. 87 Hatton Garden, in the county of Middlesex, civil engineer, send greeting:

Whereas her present Most Excellent Majesty hath granted unto me her letters patent, bearing date at Westminster, the twenty-fifth day of May, in the sixth year of her reign, for making, using, exercising, and

vending within that part of the United Kingdom of Great Britain and Ireland called England, her dominion of Wales, and town of Berwick-upon-Tweed, and also within all Her Majesty's colonies and plan-
399 tations abroad, my invention of improvements in wood pavements, flooring, and veneers, subject to the usual proviso obliging me to particularly describe and ascertain the nature of my said invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, and to cause the same to be enrolled in the high court of chancery within six calendar months next after the date of the said letters patent.

Now, know ye that, in compliance with the said proviso, I, the said Henry Austin, do hereby describe and ascertain the nature of my said invention, and in what manner the same is to be performed, as follows, that is to say:

The nature of my invention consists in glueing or cementing, in the manner after described, blocks of wood cut and placed as after
400 described, on to planks or slabs, or other pieces of wood, or on to stone, slate, or, iron, for wood pavement; and in gluing or cementing in like manner, as after described, veneers or surfaces of wood for floorings and other building purposes, cut and placed, as after mentioned, on to wood, metal, slate, stone, cement, tile, or any other suitable substance. The wood, stone, slate, or iron, on which I glue or cement the blocks for pavements, I denominate the bed or foundation of the blocks.

The wood for the blocks and veneers or surfaces is to be cut at a right angle, or any considerable angle less than that to the fibre or grain of the wood.

The bed or foundation, when of wood, of the pavement-blocks is to be placed or laid down on the earth or road with the fibre or grain of this wood running horizontally; and any wood on which the veneers
401 for floorings or other building purposes are to be laid or fixed, as after mentioned, must in a similar manner run in the opposite direction or angle to the fibre or grain of the veneer.

To make my wood pavement with wood foundations for roads, I take any suitable number of planks or slabs, or pieces of wood of convenient size and thickness, for the foundation, and this foundation is to be glued, cemented, keyed, pinned, or otherwise fastened together in compartments, upon which foundation I glue or cement the wooden blocks, of any convenient shape and size, without any fastening or connection together of the blocks, and with intervals or spaces between them to the entire depth of the blocks; these intervals or spaces may be of the width of an inch and a half, or thereabouts, and are to be filled in with broken stone, refuse or broken slate, grit, gravel, sand, or any
402 hard or any fibrous substances, this filling-in being cemented or concreted together with liquid lime or cement poured in, or with pitch or lac and caoutchouc dissolved in naphtha, melted and poured in, or with any other adhesive liquid materials. The pavement thus form' will present a constant secure footing, and avoid that slipperiness which is prevalent in other wood pavements when worn; and the great advantage which will *will* be found in this mode of pavement is, that the footing in its wear will keep pace with the wear of the blocks, and still present the same secure foot-hold. The compartments are to be strengthened by means of ledges glued or otherwise secured across them underneath; and for the purpose of securing the whole paving together when wood is the foundation, the compartments should fit into each other, or be glued, nailed, or secured, or otherwise fastened on to sepa-

rate pieces of timber laid underneath; they may also be tied
403 down where necessary by means of iron ties, or in any other convenient mode. If the blocks be square or oblong, the ends may be laid together without the intervals or spaces between the ends, but forming parallel lines, and intervals in the length only to be filled in as herein described. When the foundation is stone, slate, or iron, the blocks are to be glued or cemented on to such foundations in like manner as on to wood foundations, and the pieces or slabs are then to be laid down and embedded on the earth or road.

The method of making foot pavements is precisely similar to road pavements, except that I prefer not to leave intervals between the blocks, and the materials used may be of lighter substance and the blocks of less depth than for carriage roads.

To make my floorings I cut in the same manner in respect of the
404 angle as to the fibre as before described with respect to the blocks for pavements, the wood to form the veneers or surfaces of the floors, this wood being properly prepared and seasoned, and cut thin in the nature of a veneer; this I call my surface veneer, and I prefer for most purpose for this surface veneer the thickness of about a quarter of an inch, but I use other thicknesses as circumstances may require. I glue or cement this veneer on to the floor boards or other materials composing the floor in a similar manner as before described, with respect to the gluing or cementing of the blocks for pavements on to their foundations. This, then, forms the surface of the flooring; and it will sometimes be convenient first to form and lay the veneer on a thin bedding or foundation of planking instead of the immediate floor in compartments, to be nailed, screwed, glue, or otherwise fastened on to the floor; the veneer being glued or cemented on to this thin bedding
405 or foundation of planking in the mode described, where it is to be glued or cemented on to the floor-boards or flooring direct.

For ornamental floors I use various colored woods, natural or artificial; and after the wood has been cut into the required thicknesses for the surface veneer, I, for the most part, stamp or cut the pieces into any form desired by means of stamps or cutters; but sometimes the pieces of wood for the veneers are shaped by suitable planes to the forms required throughout their length, and are then cut across with fine saws of the thicknesses required.

If the pattern consists of very small parts, the pieces of wood to form it I glue together in lengths, and I then cut the pieces so formed into lengths across with fine saws into the required thicknesses as veneers, and with the veneers so cut I form different patterns by arranging
406 and gluing or cementing them as veneers, according to the pattern, on to the flooring boards or other floors or bedding as already described; and, in the operation of gluing, I apply pressure to the parts by any convenient means, in order to obtain as close a joint as practicable.

When the work will admit, I glue the surface veneer on to the floor or bedding as the case may be, as above described, in as large pieces or sections as practicable; and in order to guard against and avoid warping from damp or heat which might occur, and at the same time to produce more decidedly the effect or resemblance of mosaic work, I divide these large pieces or sections, after they are glued to the floor or bedding as described, into smaller parts either by stamping them or by cutting them through in opposite directions by a series of fine saws; I then fill up the spaces or joints which will be thus formed, with glue or suitable cement. The surface veneer, prepared in manner

407 hereinbefore described, I lay or fix in the required position upon, and so as to form the surface of the flooring, with glue or cement, a' above described, where there is no intermediate bedding as above mentioned; and where there is such a bedding, then, by fastening that by nails, screws, glue, or other suitable means on to the floor boards or floor.

The surface-veneer being laid and fixed, should be planed and scraped, or rubbed to an even surface and polished, if required, by sand or glass-paper, or by other desirable means.

My method of veneering and preparing veneers for other building purposes than floorings, and which I use for staircases, wainscoting, ceilings, and other building purposes, is precisely similar to my flooring, above described.

For joining my wood-pavements together, and my surface-veneers to any foundation except wood, I prefer to make use of glue, com-
408 posed of crude naphtha and caoutchouc and lac, boiled together until perfectly amalgamated, and to be used in a heated state; and the proportions of these materials may be, two ounces of caoutchouc dissolved in one gallon of crude naphtha, and three times the quantity of those two articles by weight of lac.

The glue I prefer to make use of for my flooring and other veneers where wood is the foundation, is composed of one part of isinglass and two parts of shellac, boiled together in alcohol until perfectly amalgamated, and to be used in a heated state; but for either of these purposes any glues, sufficiently strong and not so affected by moisture or such a degree of heat as to injure the joints, would effect the object.

409 I have described the method to be pursued with my improvements in wood-pavement, floorings, and veneers, which is most simple, in my apprehension, though it must be evident that there are other ways of effecting some of the details pointed out. I am aware that small pieces of wood, cut in some such way as to resemble what is before-described, have been at times applied in the manufacture of small ornamental furniture and fancy articles, and I do not claim this, but I do claim as my invention—

First. The glueing or cementing of wood, cut at such angle as to its fibre, as before described, on to planks or slabs or other pieces of wood, or on to stone, slate, or iron, for wood-pavements; or on to wood, metal, slate, stone, cement, tile, or any other suitable substance, for the
410 purposes of veneers for flooring and other building purposes.

Second. The securing of wood-paving blocks on to planks or slabs, or other pieces of wood, or on to stone, slate, or iron, without any fastening to each other, with intervals or spaces between the blocks, except at the ends where the blocks are square or oblong, as before-described, and the intervals to be filled in, in the manner hereinbefore described.

Third. The application of such veneers, as hereinbefore described, to flooring and other building purposes.

And such my said invention being, to the best of my knowledge and belief, that entirely new and never before used for the same purpose or purposes within that part of her said Majesty's United Kingdom of Great Britain and Ireland, called England, her said dominion of
411 Wales, or town of Berwick-upon-Tweed, or in her said Majesty's colonies or plantations abroad; and I do hereby declare this to be my specification of the same, and that I do verily believe this my said specification doth comply in all respects fully and without reserve or

disguise with the proviso in the said hereinbefore, in part recited, letters patent contained; wherefore I hereby claim to maintain the exclusive right and privilege of or to my said invention.

In witness whereof I have hereunto set my hand and seal, this twenty-fifth day of November, in the year of our Lord one thousand eight hundred and forty-three.

HENRY AUSTIN. [L. S.]

412 And be it remembered that on the twenty-fifth day of November, in the year of our Lord 1843, the aforesaid Henry Austin came before our said lady the Queen in her chancery, and acknowledge' the specification aforesaid, and all and everything therein contained and specified, in form above written.

And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

Enrolled the twenty-fifth day of November, in the year of our Lord one thousand e'ght hundred and forty-three.

LYNCH.

413 *Def't's Ex. No. 20, E. G. T., S. E.—January 20th, 1871.*

A. D. 1843.—No. 9640.

WOOD PAVING.

Crannis and Kemp's Specification.

To all to whom these presents shall come, we, Joseph Crannis, of Southwark, in the county of Surrey, furrier, and Robert Kemp, of Southwark, aforesaid, furrier, send greeting:

Whereas Her present Most Excellent Majesty Queen Victoria, by her letters patent, under the great seal of Great Brita'n, bearing date at Westminster, the twenty-first day of February, in the sixth year of her reign, did, for herself, her heirs and successors, give and grant unto us, the said Joseph Crannis and Robert Kemp, our ex'ors, adm'ors,
414 and assigns, her especial licence, full power, sole privilege and authority, that we, the said Joseph Crannis and Robert Kemp, our ex'ors, adm'ors, and assigns, and such others as we, the said Joseph Crannis and Robert Kemp, our ex'ors, adm'ors or assigns, should at any time agree with, and no others, from time to time, and at all times thereafter during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within that part of Her said Majesty's United Kingdom of Great Brita'n and Ireland, called England, her Dominion of Wales, and the town of Berwick-upon-Tweed, our invention of "Certain improvements on wood paving"; in which said letters patent there is contained a proviso that we, the said Joseph Crannis and Robert Kemp, or one of us, shall cause a particular description of the nature of our said invention, and the manner in which the same is to be performed, under our or one of our hands and seals or hand and seal, to be inrolled in Her said Majesty's high court of chancery within six calendar months next immediately after the date of the said in part recited letters patent, as in and by the same, reference
415 being thereunto had, will more fully and at large appear.

Now, know ye that, in compliance with the said proviso, we, the said Joseph Crannis and Robert Kemp, do hereby declare that the nature of our said invention, and in what manner the same is to be per-

formed, are fully ascertained and described in and by the following specification thereof, reference being had to the three sheets of drawings hereunto annexed, marked A, B, and C, that is to say:

Our said invention consists, in the first place, of certain improved foundations for wood paving, which foundations are to consist also of wood, and are to be formed in manner following:

Figure 1, sheet A, of the said drawings, is a plan of a foundation which offers great facilities for streets where the paving requires to be frequently taken up to get at the water, gas, and other pipes. Two or more planks, *a a*, are laid at suitable distances in the direction of the length of the street, and joined together at the ends by any of the twelve different methods represented in figures 3 to 14, both inclusive. On these planks there are laid transversely a number of short planks,
416 *b b b b*, which are double bevelled at the ends in the manner shewn in the detached view given of one of these planks in figure 2, so that each plank interlocks with the planks at its two ends, but small vacant spaces, *c c c c* (caused by the ridge *d* between the double bevels), are left between the sides of the planks for the purpose of drainage. The transverse planks abutting against the curbs are squared to fit the curbs, and may be secured to the outer longitudinal planks by pins or bolts; we also pin the longitudinal and transverse planks together at any places where there may happen to be openings to the sewers or water-mains, but we do not pin them together in any other parts than those which have been mentioned, because the effect of all superincumbent pressure on a foundation, the parts of which are jointed in the manner which has been described, can only be to bind them more firmly together. When it is desired to take up such a foundation, or any part of it, one of the transverse pieces next the curb, which have their outer ends plain, and are therefore easily removable, is first taken up, when the rest come readily asunder, and as soon as room is made by the removal of the transverse planks the lower longitudinal ones are prized up with the greatest ease.

417 In figure 15 there is shown a modification of the foundation just described, in which five longitudinal sleepers are used, and the transverse planks are cut at the ends in the form of what is called a ship-lap, as shown separately in figure 16, and abut against or overlap the longitudinal sleepers; they are also laid either diagonally in respect of the longitudinal sleepers, as shown in the half C of figure 15, or at right angles with them, as in half D, figure 15. Figure 1 (sheet B) represents a plan of a foundation suitable for dry and hard ground. It consists of a number of short planks bevelled both at the ends and sides, so that any number of them may overlap and underlap each other and every plank be at once supported and supporting. A plain side view and end view of one of these planks so bevelled are given separately in figures 2, 3, and 4, sheet B. Instead of the lower planks being laid lengthwise and the upper crosswise, as represented in figure 1 and 15, sheet A, their relative positions may be reversed, that is, the lower may be laid crosswise, and the upper ones may be laid lengthwise or diagonally; or the lower planks *a* may in some cases be dispensed with altogether by cutting a groove along the faces of the upper
418 planks which abut against the curb-stones, and inserting a long fillet or dowel into these continuous grooves, which will bind the whole pavement securely together.

Where the curb-stones happen not to be laid evenly, or are liable to much disturbance, it will be found useful to insert a thin plank laid on edge between the outer planks of the pavement (whether there are two

layers of planks used or one only) and the curb-stones; and, further, instead of the longitudinal and transverse planks being jointed together in any of the modes before described, they may have notches made in their ends and dowells to suit inserted therein, which dowells may, for the sake of greater security, be extended from any couple of planks to the next adjoining planks either at the ends or sides.

Secondly, our invention consists in certain improved forms of blocks or improved combinations of blocks of known forms for wooden paving, which may be used either with or without such foundations, but all, excepting as is hereinafter excepted, have for their especial object the affording a sure footing for horses in all weathers and under all diversities of local circumstances. Figure 17, sheet A, is a plan, figure 18 an end view, and figure 19 a side view, of the first of these
419 improved forms or improved combinations of known forms. The blocks are of a parallelogramic form, and of two different sizes, in point of height and thickness, and they are laid with the grain of the wood in a vertical position in rows side by side, in such manner that the high and low blocks alternate in each row, and the high blocks of each row are opposite the low blocks of the adjoining row, whereby a surface is produced having an equal number of raised and sunken parts, the former of which afford so many points of support to the feet of horses as well sideways as lengthwise. In figure 19, sheet B, we have given a section on an entire bre'dth of the carriage-way of a street laid on this plan upon a substructure such as is represented in figure 1, sheet A, and has been before described. Figure 20, sheet A, represents a pavement consisting of a number of narrow blocks of a parallelogramic form, and of equal heights with the grain of the wood, at an angle, chamfered at top and bottom in the manner shown in the drawing, and laid in rows at reverse angles, whereby a ridged surface is produced, possessing
420 similar advantages in respect to foot-holding to the former pavement shewn in figures 17, 18, and 19. Figure 21 represents a form of paving similar to that last described, with the exception that the blocks are chamfered at the top and bottom a little differently, having three facets at their ends instead of two. The blocks of both of the two forms of pavement last described, when worn on one side, may be turned upside down, so as to present a new surface; or when they are more worn in the direction of the angles at which they are laid than in the opposite direction, they may be taken up, and the angles at which the rows are laid be respectively reversed.

Figures 22 to 24, both inclusive, represent the surfaces of various forms of blocks, any one of which may be used in wood paving, with the fibre placed vertically or at an angle, and made to afford a good foot-holding, either by surface grooving or cutting, or by causing rows of blocks of the particular form selected to alternate with shorter blocks of any convenient form, or by a combination of both of these methods.

In Figure 35 we have shewn how, for example, blocks of the circular form, Figure 31, may be grooved and combined so as to pro-
421 duce a surface that will afford security equally against slipping lengthwise as sidewise; one half of the blocks have grooves cut across their centres, and the other half have segments cut away at each side to the same depth as the grooves; and by laying them in rows consisting of one of each sort alternately, the surface will be found to exhibit a regular alternation of raised and sunken parts, both longitudinally and transversely.

Figure 36 shews how a similar effect to that obtained by the arrangement last described may be produced by cutting away a segment from

the top surface of the block, Figure 31, to any convenient depth, and inserting in the vacant spaces left, when a number of such circular blocks are laid together, small diamond or square blocks of the forms Figures 25 or 29.

Figure 37 is a plan of a pavement composed of blocks presenting on their surface, previous to grooving, the form shewn at Figure 25, but having two sides inclined to the horizon; angular grooves are cut across the centre of the top surfaces of these blocks, and they are also cut away at one end to the same depth as these grooves. The blocks, when so grooved, are so arranged in rows that one row has all its grooves
422 inclining in one direction, while the next row has all its grooves inclining in the opposite direction, the result of which is that every hollow part is stopped at both ends by a raised part, and a sure foothold is thus presented to the feet of horses in every direction.

Figure 38 is a plan of a pavement formed by a series of blocks of the form Figure 33, each block being of a hexagonal shape, with two of the facets cut away to any convenient depth to form the groove; or a pavement of the like form may be constructed by making use of two sets of blocks in alternate rows, one of the form of a parallelopiped, having the two end faces narrower than the others, and the other block of the form of a parallelogram, shorter than the former, to form the groove between the parallelopiped blocks.

Figure 39 is a plan of a pavement composed of blocks of the forms Figures 22 and 28. Two rows of blocks of Figure 28 are first laid face to face at a little distance apart, and then a row of shorter pieces of a parallelogramic form to suit the intervening space introduced between them, after which follow two rows of small pieces of the parallel-
423 ogramic form, Figure 22, the one shorter than the other. By a continued repetition of this arrangement a surface is produced, which, though it differs from all those before described, inasmuch as its principal lines of grooving, namely, those between the pentagonal blocks, Figure 28, are continuous instead of divided, will probably be found in practice to be equally efficacious for the prevention of slipping, as the lines referred to, though continuous, are of a zigzag form, and present at every turn a sufficient resistance to any outward thrust.

Figure 40 is a plan of a pavement composed of blocks of the form of Figure 23, having the upper face of the blocks cut away on one side to form a groove in conjunction with the high side of the adjoining block, and instead of being laid in rows parallel with the curbs, they are laid in rows running angularly across the street, which brings the hollow part of each block opposite the raised portions of the blocks of the two adjoining rows.

Figure 41 is a side view of a pavement composed of blocks of
424 the form Figure 22, but with one-half of them rounded at top, and about twice the thickness of and a little lower than the others, laid alternately in rows, with the hollow spaces produced by those with curved surfaces placed opposite the solid of the other blocks.

Figure 42 is a side view of a pavement the same as Figure 41, excepting that the rounded blocks are less than half the thickness of the others. In both the sorts of pavement last described the curves may be cut at top and bottom of the same form, so that when worn on one surface a new surface may be produced by turning them upside down.

Figure 43 is a side view of two small blocks, which, by being cut away on two sides in the manner shewn, mutually support each other, and may be grooved on the top surfaces in any of the modes before or hereinafter described, or any others deemed more suitable. A pave-

ment formed of a series of such blocks will be exceedingly durable, and, like some of the others before described, may after years of use be made as good as new by simply turning the blocks upside down.

425 Figure 44 shews a mode of keying together a number of square blocks with the fibre placed vertically, in order to form a secure pavement. H H are two blocks which are cut away on two sides from corner to corner, but at each side in an opposite direction to that cut on the other side. K is the key-piece, of the form of an inclined parallelogram, and of double the thickness of the cuts from the sides of each of the blocks, and an inch or two less in height than these blocks. When this key is inserted, as shown in the figure, into two of the side cuts so formed, it projects half-way to take a similar hold of two other blocks corresponding to H H, and by a repetition of the same arrangement a pavement is formed which is held inseparably together by the keys, but may be drawn asunder in an instant by the taking out of any one of them. The hollow spaces occasioned by the difference in height between the keys and blocks will furnish considerable footholds for horses, but additional grooves may be cut in the surfaces of the blocks if found desirable.

426 Figure 45 is a side view of a modification of the plan of paving last described. Instead of the square blocks being cut away at two of the sides from corner to corner, the corners themselves, *m m*, are cut away, and a projecting piece, *n*, left in the middle; *k* is the key-piece, as before.

Figure 46 is a modification of Figure 45, in which the key-piece is dispensed with, and the blocks are interlocked directly with one another.

Figure 47 is a side view of a block, of two tiers each, of an inverted pyramidal form, by joining to which other blocks of the same form, turned the reverse away, the blocks rest by their ledges one upon the other, and a combined pavement is formed of great strength and durability; this also may be grooved on the top if required.

427 Figure 48 is a side view of a block with the fibre placed at an angle, cut on the opposite sides, in the same way as in Figure 43, so that the blocks shall mutually support each other.

In Figure 49 the block is of the same form as 48, but each block is cut away on its four sides in such a manner that in a pavement formed of a series of such blocks the top half of each block rests at one side on the projecting ledge of the block next adjoining.

Figure 50 shows a block in every respect the same as the last, with the exception that it is placed with the fibre vertically.

Figures 51, 52, and 53 represent a mode of forming a pavement of square upright blocks, in which they are combined in sections of four each, and these again with other sections of the like number. Small triangular grooves, *s s s s*, are cut out of the four corners of the blocks, which meet inside, and into these grooves are inserted small, square

428 key-pieces, *t t* (Figure 53).

Figure 54 represents a mode of forming a pavement out of round poles in their rough state; they are to be cut slantingly into two short blocks, which are to have three notches, *n n n*, made in their sides (two only of which are seen in the figure), and pieces of quartering, *q*, are to be inserted in the triangular space formed by the coming of two of three notches together, as shewn in Figure 55, so that any three blocks when thus brought together will be mutually supported by the quartering.

Figure 56 is a side view of five of these blocks placed in a row together.

Figures 57 and 58 shew the forms of construction represented in Figures 49 and 50 applied to round blocks of the description of Figure 54.

Figure 59 shews a mode in which any two or more blocks which
429 are not so shaped as to interlock with each other may be united, by cutting corresponding grooves of a triangular shape in each, *v v*, and introducing into the grooves a piece of quartering or key-piece to fill the space so formed.

Figures 60 to 75, both inclusive, represent side views of various forms of grooves which may be given to the upper surfaces of blocks, either by cutting them wholly or in the solid of a single block, or partly out of the side of one block and partly out of the side of a second, made to fit the other, or by inserting a short centre block (shaped at top to suit any of the given figures) between two single blocks.

Figures 76 and 77 represent a mode of forming, by the vertical application of a hand-tool, grooves in blocks or wooden pavement which has been laid down without lifting the blocks out of their places. We
430 employ for this purpose a common centre-bit, and bore out the wood in a series of circles in the line of the intended groove; but instead of the circles being independent of each other, as shewn in figure 77, each circle returns half way back on the preceding one, as represented in figure 76, so that all interstices between the circles are removed, and nearly as clear a groove is formed as if it were cut out longitudinally. A number of such centre-bits might be fixed in a frame, and so connected together as to be worked simultaneously by a winch or other suitable means.

Figure 13 is a side view, and figure 14 (sheet B) a plan of a form of pavement suitable for steep inclines. The blocks are inclined parallelograms, chamfered, of two facets at top and bottom, and laid in regular transverse rows, but inclining backwards at a considerable angle to the ground. The blocks in each row are so arranged in respect to
431 the blocks in the adjoining rows that the hollows of each row come opposite the raised parts of the adjoining rows, and in this way, whether horses are ascending or descending, a sure foothold is afforded to them in every direction. When the blocks are worn on the upper surface a new surface may be formed by reversing them.

Figures 15 and 16 represent vertical blocks of the same form as those last described, with the double facets on the upper surface only, which, when laid on an inclined plane forms an upper surface, having the same properties as figures 13 and 14.

Figure 17 is a side view, and figure 18 a plan of a form of pavement also suitable for inclined surfaces, which is similar to figures 13 and 14, with the exception that the blocks are chamfered at top and bottom of three surfaces instead of two, and thus present a deeper foothold
432 for horses. Instead of several forms of pavements before described, being composed of entire blocks cut of the forms represented, they may be composed of a number of small blocks or parts of blocks, which, when joined, shall produce the same effect, and in many cases there may be considerable economy in such a substitution of smaller blocks for larger. Where also any of the forms before described is produced by employing two half blocks or four quarter blocks instead of one entire block, the parts may be connected together, when deemed desirable, by means of glue or any other suitable cement, or by means of pins or bolts, or other fastenings. And in laying down pavements composed of any of the preceding description of blocks, this general rule should be observed, namely, so to lay the blocks that they shall everywhere break joint, or, in other words, so that the joinings of

433 each couple of blocks shall come against the solid parts of the blocks adjoining. We do not limit ourselves to any particular dimensions, especially in respect to the thickness of the blocks; but it deserves to be noticed, that where the grooves for forming footholds are produced by combining blocks of two sizes and shapes, the one shorter than the other, there is a *a* great saving both of material and labor in comparison with the plan of cutting out grooves in the solid faces of the blocks. A foundation of three-inch planking, formed as aforesaid, with blocks of four or five inches deep laid upon it, will generally be strong enough for all purposes of traffic.

Thirdly. For stables, cow-houses, and other like buildings, we propose to make use of pavements of the forms represented in figures 5 and 6, figures 7 and 8, and figures 9 and 10, of sheet B. The head of each stall may be laid with blocks of any of the sorts herein de-
434 scribed, and the body of it with blocks or planks laid with the fibre longitudinally, or nearly so, and brought flush up the one with the other, but having channels, *a a a*, ploughed in their upper surfaces at a distance from the joints, which channels lead either in straight lines to one common drain, as shown in figures 5 and 6, or in angular lines to the centre and bottom drains, as shown in figures 7 and 8, or in angular lines to two side drains and one bottom drain, as shown in figures 9 and 10. The channels *a a a* carry off the urine or any water or moisture, and prevent it from finding its way between the joints, or settling anywhere. The drains may be made either of grooved planks, or of iron, or of brick, or any other suitable material.

Fourthly, and lastly, we form pavements suitable for the footways of public streets, the interior of public and private buildings,
435 the court-yards of private mansions, and other similar places, as also for decks of vessels, and generally for all footways of wooden blocks laid on end, or with the fibre upwards, of various forms and of various colors (produced either naturally or artificially), and assorted and arranged in the manner known by the name of Mosaic or tesselated pavements. Twelve different specimens of this sort of pavement are given in sheet C. Where the ground is firm and even on which the blocks are to be laid, and there are good curb-pieces to hold them tight, they may be laid down without any fastenings; but where circumstances require it, they may be connected together by any of the modes of interlocking hereinbefore described, or by pins and bolts, or by any suitable glue or cement, or by laying them in sections of 4, 8, or 12, or more, in wooden or iron frames, which would also enable them to be removed more when required.

436 And having now described our said invention, and in what manner the same is to be performed, we declare that what we claim is—

First. The methods hereinbefore described of forming wooden foundations for wooden pavements.

Second. The several forms hereinbefore described of forming and joining the blocks used in the superstructure of wooden pavements; also the methods herein described of grooving or placing the blocks high and low to form grooves and stops, with the exception of that represented in Figs. 51, 52, and 53, which we believe to have been proposed before, and whether the same are used in combination with our wooden foundations or in combination with any other sort of foundation.

Third. The methods hereinbefore described of paving with wood, stables, cow-houses, and other like buildings. And fourth, the employments for footways of blocks of wood, laid on end, or with the fibre

437 upwards, of various forms and of various colors (produced either naturally or artificially), and assorted and arranged in the manner known by the name of Mosaic or tesselated pavements.

In witness whereof, I, the said Robert Kemp (party hereto), on behalf of myself and the said Joseph Crannis, have hereunto set my hand and seal, this twenty-first day of August, one thousand eight hundred and forty-three.

ROBERT KEMP. [L. S.]

438 And be it remembered that on the twenty-first day of August, in the year of our Lord 1843, the aforesaid Robert Kemp (party hereto, on behalf of himself and the said Joseph Crannis) came before our said lady the Queen, in her chancery, and acknowledge the specification aforesaid, and all and every therein contained and specified, in form above written. And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

Enrolled the twenty-first day of August, in the year of our Lord one thousand eight hundred and forty-three.

LYNCH.

[Here follow diagrams.]

Def'ts' Ex. No. 21. *E. G. T., S. E., Jan'y* 20, '71.

439 A. D. 1844. No. 10187.

PAVING AND COVERING ROADS, &C.

Fontainemorcau's specification.

To all to whom these presents shall come I, Peter Armand le Comte de Fontainemoreau, of Skinner's Place, Sise lane, in the city of London, send greeting:

Whereas her present Most Excellent Majesty Queen Victoria, by her letters patent under the great seal of Great Britain, bearing date at Westminster, the fifteenth day of May, in the seventh year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Peter Armand le Comte de Fontainemoreau, my executors, administrators, and assigns, her especial license, full power, sole privilege and authority, that I, the said Peter Armand le Comte de Fontainemoreau, my executors, administrators, and assigns, and such others as I, the said Peter Armand le Comte de Fontainemoreau, my executors, administrators and assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use,
440 exercise, and vend, within England and Wales and the town of Berwick-upon-Tweed, the said invention for "a new and improved mode or method of paving and covering roads and other ways and surfaces," communicated to me by a certain foreigner residing abroad, in which said letters patent is contained a proviso that I, the said Peter Armand le Comte de Fontainemoreau, should cause a particular description of the nature of the said invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, to be enrolled in Her said Majesty's high court of chancery within six calendar months next and immediately after the date of the said in part recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

Now know ye that, in compliance with the said proviso, I, the said Peter Armand le Comte de Fontainemoreau, do hereby declare that the nature of the said invention communicated to me, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement, reference being had to the
441 drawings hereunto annexed, and to the figures and letters marked thereon (that is to say):

The new or improved mode or method of paving and covering roads and other ways or surfaces consist' in the manner in which I set, assemble, and join together wooden blocks by means of rods, key-rods, pins, or bolts, which I adapt to every block and row of paving so as to consolidate, connect, and bring together every row, that they may mutually sustain one another and form thus a whole of adequate solidity, but very easily raised and removed in case of repairs or any other underground operation, and in combining wooden blocks with granite or wooden blocks with bricks, Indian-rubber, asphalte, cement, marine glue, and other similar substances to prevent horses slipping, and to increase the durability of the wood by diminishing its exposure to the influence of air and water. The ground for laying my new and improved mode of paving does not require any setting; it is only to be rendered smooth and even, and then to be covered with a bed or
442 layer of sand, by laying the blocks upon a body of sufficient elasticity to yield to the jolts and weight of the passing carriages. The continual resistance offered by a rigid, firm, underground foundation, when heavy loads pass, is therefore avoided. It is easy to conceive that the paving will last much longer if allowed slightly to yield under the pressure of horses and carriages, since by these means the grooves cut out in the wooden blocks will not be so soon worn out as now happens to every wood paving having masonry or a hardened underground. I cut my wooden blocks by the means usually employed. As some of the several forms of wooden blocks I use, and also my combined paving, require a separate and different mode of jointing and connecting, I will successively describe the several means I have adopted, and those I found to answer best.

Figure 1, drawing I, shows that I form my jointing by means of grooves cut transversely in each block at half its height. The depth and width of the grooves varies according to the size of the blocks; for blocks five and a half inches high, the grooves ought to be from
443 three-quarter inch to one and a quarter inch wide, and from an inch to one and a quarter deep; for blocks of four, three and a quarter, three, two and three-quarters, two, and one and three-quarter inches high, the grooves may be, respectively, three-quarters, five-eighths, half, three-eighths, quarter of an inch wide. The rods which are to be fitted into these grooves are to bind each row of blocks to its succeeding row, one after the other, as far as required. Each row of blocks is inclined alternately to the right or to the left of the street, and terminates in the voussoir *a*, which occupies the centre of the road, the longitudinal section giving a view of the larger faces of the blocks; and the extremities of the rods shows that the blocks in this view appear perpendicular. The moveable key shows the facility with which repairs may be made. My firm jointing is very easily separated, and will facilitate the taking up and replacement of paving so frequent in streets under which pass numbers of pipes for gas, water, &c. The ease with which these moveable keys are removed does not in any degree injure the solidity of the combination. An examination of the plan
444 will prove to the contrary, that they even contribute to the solid

ity by the shape of the rods. These keys, by means of the rods, are bound to the solid blocks, which can neither rise nor sink. These moveable keys are seen in a front view at the extremity of the ground plan, and may be indifferently sloped upon two, three, or four sides, according as it is required.

Figure 2, drawing I, shows that I form my jointing by the same means as those of the figure 1. The paving-blocks, instead of being inclined as those of the said section, half of them to the right and half to the left of the road, are sloped longitudinally without a voussoir. The transverse section shows the rods at their extremities, and the paving-blocks in this view appear vertica' on their largest face. The longitudinal section shows the manner in which the blocks are bound together by the rod, and by overlapping each other. This rod pierces half the wood in each row of blocks. It may be of any length, but it must be scarfed; that is to say, every joint must take place in the middle of a block, in order to maintain the firmness of the blocks between them. The moveable keys are seen in front view in the trans-
445 verse section, and seen horizontally in the ground plan. It is easy to comprehend the firmness which the rods give by their shape, and the facility with which the moveable pieces may be taken up without disturbing the solid parts.

Figure 3, drawing I, exhibits a combination of wooden blocks of eight sides, grooved upon every side at half the heig't*h*, and square blocks grooved upon their four faces. In these grooves I insert small pins of the same length as the sides, which serve to bind the octagonal to the square blocks. This form of paving allows the employment of round blocks. Any log of wood may be used for this kind of paving. For the rods which fasten together the blocks, chips of wood may be used. In the transverse section is seen the jointing of the eight sides with the rods. The longitudinal section differs in no respect from the transverse. The moveable keys are placed in the same manner as the preceding; but they differ, in that each block can form by itself a key. The key-block is divided into three parts, as is shown in the drawing of the moveable keys. The middle part, which is used to render
446' the other two parts firm, can be raised with a crowbar; and when once this is raised, the rest is taken to pieces easily. I can offer this form of paving at a lower price. It is especially suitable for footpaths, warehouses, shops, factories, &c. It is also more elegant than the other kinds.

Figure 4, drawing I, shows that the joints are effected in the same manner as in figure 3, with rods and grooves on the six faces of the blocks, in which are fitted the small pegs, which are of the same length as the faces, and which connect the blocks together. The longitudinal section is similar to the transverse section. The moveable keys are similar, and as seen at the extremity of the plan. Instead of hexagonal I can employ with equal advantage circular blocks, as shewn in the plan, and two sections which compose figure 17, drawing II; the blocks are laid in juxtaposition one with another, and can be of different sizes, that is to say, I can place one row of one size and the next row of a smaller size, without decreasing the strength or durability of that mode of paving. They are jointed as the blocks hereinbefore described,
447 either with rods or pegs, which connect them horizontally. The longitudinal section shews the wooden blocks in a vertical view. The moveable keys are similar to those of figure 3. Any kind of wood, whatever may be its size, can be used for this form of paving, because this form approaches very nearly to the shape of the trees, and it is

more easily prepared and does not require any particular labor. The horizontal section shows the round logs, and that between the blocks triangular hollows or spaces are left into which I pour a material hereinafter mentioned, and which, on account of its elasticity and softness, does not pulverize.

Figure 6, drawing II. shows that I form my jointing by means of cones, which are grooved horizontally at half their heigth. In the transverse section may be seen between the cones little cuneiform pieces, also grooved at half their height. In these grooves I fit the key-rods which bind together the little cuneiform pieces and the cones. By means of this shape the facility of removal is increased, and when one of the blocks is raised the rest are easily taken to pieces. The
448 part that is cut out of each block in no respect injures the strength of the block. These blocks may be bevilled on their four faces; but then I am obliged to place cuneiform pieces upon two of their faces. The longitudinal section shows the square wooden blocks placed vertically.

Figure 7 shows the square blocks laid on one face in oblique juxtaposition with each other. The little bracket projecting from each block serves to support it from the preceeding block, and which is fixed with pegs or in any other manner, such as by marine glue, &c. I employ indifferently for this jointing, brackets, rods, or pegs, in accordance with the diagonal form. The longitudinal section represents the square wooden blocks reclining one on another. These blocks slope diagonally; this is the only form which has a double inclination. Each block reposes upon two others. The ground plan exhibits the alternations of lozenges side by side. To obtain the slope of this form, it is necessary to cut the log from one angle to the other.

I will now describe my mode or method of paving by means of wooden blocks combined with bitumen, bricks, cement, asphalte, Indian rubber, and similar substances. The combined paving is exhibited, firstly,
449 in a transverse section; secondly, in a longitudinal section; thirdly, in a ground-plan; and fourthly, moveable keys.

The transverse section, Figure 8, represents a front view of a row of alternate blocks of wood and stone. The blocks and the cuneiform pieces have a longitudinal groove at half their height, and in these grooves fit the rods which fasten these together and bind also the blocks to the adjacent row, that the cuneiform pieces so placed have an empty space between the two wooden blocks. It is this space that the stone blocks are to occupy. In examining the longitudinal section it may be thought, at first sight, that the rods shown longitudinally fasten together the stone blocks and the wooden blocks; but when the transverse section is examined it is easy to see the contrary, because the stone blocks are bevelled upon two of their faces, and the wooden blocks are square upon their four faces. The cuneiform pieces occupy the place which is left between the wooden and the stone blocks, and hide the rod which joins them to the wooden blocks. Thus firmness
450 is gained by the joint of the rod and of the groove. Then the granite blocks, fitting into the empty spaces which are left between the cuneiform pieces of the right and of the left rows, complete by their pressure on the wood, the firm joint began by the rod and groove. The horizontal section represents the chequered surface by the alternate juxtaposition side by side of stone and wood. The moveable key has been figured front view at the extremity of the ground plan.

Figure 9 shows a front view of alternate stone and wooden blocks of a wedge shape. The blocks of wood being larger at their base, the

first row is made to cross by its lower part with the second, and the peg shown in the transverse section binding the two rows together, forms, therefore, successively a solid joint. This mode of support may be obtained in two ways, by a peg or by a small rod and a groove which is cut on the square face of the blocks. This joint is preferable to that of the peg, because it requires less work, is of great simplicity, and very solid. The longitudinal section shews the wooden and gran-
451 ite blocks placed vertically and alternately side by side. The moveable key is shewn at the extremity of the ground plan. The ground plan shews the chequered alternation of wood and stone. This shape would be of a very good construction if made entirely of wood. Figure 10 shews a transverse section alternately wood and stone; it may be equally all wood. The cuneiform pieces which are in contact with the sloping sides of the wooden blocks are mitre cut as the block; the wooden paving blocks fit to the cuneiform pieces, and in the space between the stone or granite wedge-shaped blocks joint themselves. If they are all wooden, they ought to be cut as shewn in the transverse section B. The cuneiform pieces exhibit their two mitre cuts on the two transverse faces. The wooden blocks are cut in the manner shewn in the transverse section. This form offers the
452 advantage of easy removal in any part whatever. It can be done by means of a crowbar; and when once a single block is out, the rest takes to pieces with ease. If the paving is laid down, as shewn above, in the transverse section of wood and stone, the brackets repose on a longitudinal rod such as is shewn in the transverse section. It is this rod alone which, being between them, gives support to each row of blocks. The horizontal section represents a chequered figure alternately wood and stone in juxtaposition side by side.

Figure 11 represents a combination alternately wood and stone; it may be indifferently all wood. The blocks of wood of the first row cross those of the second, as it is seen in the transverse section by the dotted lines. It is by the crossing of the wooden blocks that I form my joint with the small key rods, which are seen endwise in the transverse section, between the plain and the dotted lines. The moveable keys are represented at the extremity of the ground plan.

Figure 12 shows a row of blocks alternately stone and wood crosswise. The wooden blocks are supported by small brackets cut angu-
453 larly. These small brackets repose on the longitudinal rods which render the right and left rows firm. Between these brackets fit the stone wedge-form blocks. The longitudinal section shews the wooden and the stone blocks placed vertically and alternately.

In the base of these wooden blocks are seen the rods figured longitudinally which pass behind the granite blocks. The moveable keys are placed at the extremity of the ground plan. As I combine the wooden-block paving with several substances, I have considered those which would resist more effectually the abrasion caused by the wheels and horses' feet, and to choose those which, whilst giving a better and more sure footing, should be less liable to be worn out by the friction, and should present at the same time economy, durability, and simplicity of laying equal to wood. I have also investigated the several relative properties which the substances I had in view possess, as regards expansion and contraction, when compared with wood. Wood, during heat, contracts, and asphalte, bitumen, India rubber, marine glue, and other similar substances expand at the same time.
454 On the other hand, during humid and cold seasons, these last

contract, and the former swell or expand. I have had, therefore, to discover the exact and relative proportions of these properties in a ratio such that the expansion of the one should be compensated by the contraction of the other when laid together. The failure of all the attempts to combine different materials is due to the want of proper attention to these very proportions. The four last forms of wood paving I have described, videlicit, those of Figures 9, 10, 11, and 12, I can combine with bitumen, asphalte, India rubber, as well as with granite, hereinbefore described. These forms cause a great economy of wood, half of which is saved in thickness, for wooden paving-blocks two and a half to three inches high may be used instead of five or six inches, as has been thought necessary, and the labor of grooving dispensed with.

Figure 13 shows a transverse and longitudinal section and a horizontal view. The transverse section represents the wooden blocks and those of bitumen, asphalte, or brick alternately laid.

455 The bitumen blocks are cast, and their form is shewn in the transverse section. They are bound to the paving blocks the whole length of the street. The longitudinal section represents a side view of the wooden bitumen and brick paving-blocks. The brick paving-blocks are provided with holes in order to receive the pins by which they are united to the other blocks. The pins which are to be inserted in the bitumen or asphalte blocks are placed in the moulds before the casting of the blocks. The moveable keys are represented at the extremity of the horizontal view, in which are exhibited the brick and bitumen or asphalte paving-blocks.

Figure 14 is composed of transverse and longitudinal sections of a horizontal view of moveable keys and of two blocks marked A A. The transverse section shows some paving-blocks vertically laid. I compose this mode of paving in two different ways. I use for the first blocks in which I cut on the face grooves half an inch deep, and from one-half to one and a half inch wide, into which I firmly fix the small lengths of boards or laths; these grooves are distant one from the other

456 three quarters to one and a half inch; the hollow parts between the boards are filled up with bituminous substances.

According to the second method I insert in every mould the ends of boards from two to two and a half inch long. Their thickness is represented on the transverse section, their width on the longitudinal section. These pieces are cut in the middle of their height, and placed in the cast-iron mould, which keeps them steady until the base of the block be cast. This base is composed of prepared bitumen, the cost of which is at least two-thirds less than the price of the asphalte, and is as efficient. I make use of the asphalte for the upper part or surface of the paving-block, the base being cast as before stated. I turn over the block and cast the asphalte in the hollow part, and thus, by means of the wooden pieces, unite the inferior and superior part of the block. The modes of putting together this kind of block renders them easy of removal in any part of the paving. I cut at half the height of the wooden block, on the four faces, grooves from three-quarters to one and a quarter inches square; for the bituminous blocks I insert four small laths in the four sides of the moulds which form the grooves of the move-

457 able blocks, and for the permanent blocks the small rods are fixed into each of them. The transverse section will demonstrate the solidity and facility of removal of this paving as it represents the small pegs. Half of the surface is occupied by the small laths, and the other half by the bitumen, which forms and unites the whole road.

Figure 15 comprises a transverse section, a longitudinal section, a

plan, moveable keys, two paving-blocks, surface-views, and a third paving-block. Figure 18, also surface-view. The transverse section is composed in two ways: first like the preceeding, of grooved logs, from two to three inches square, or grooves and holes are cut alternately; in the second method I employ the ends of planks or laths of wood of equal length. These planks and laths may vary from one-quarter to half an inch in thickness, and the bitumen in the same proportions (see the figure of the two blocks *a a*, at the extremity of the Figure 15). This mode of combination differs from the other. This form is put together by small pegs projecting from the middle of the four faces of the
458 block, or equally well from the four angles. The two rows are laid at the same level, and driven together from the jointing. If the blocks are made of asphalte, the four faces of the mould ought to be provided with a small plug of three-quarters of an inch, and one and a quarter inches in circumference, to form the holes for the pegs which bolt the blocks to each other. If the blocks are wooden, holes three-quarters of an inch deep must be bored in the four faces with a brace and bit; in these holes are inserted small wooden pegs or pins one and a quarter inch thick; half of each peg enters the block on its right and the other half the block on its left. The pegs may also be made of metal. These holes ought to be accurately pierced from the side of contact.

In this form also I lay a foundation of logs, and the holes intended to receive the pegs or pieces are bored obliquely; from this obliquity results still greater firmness. The crossing of the pins also prevents the shifting of the surface. The facility of removal is obtained in the same manner as in the key, Figure 16. In the longitudinal section the thickness of the peg or pin is shewn, and the place it occupies is
459 shewn in Figure E E.

Figure 16 comprises a transverse section, a longitudinal section, a surface-view, moveable keys, a paving-block.

Figure 19, a small ground-plan, and two longitudinal sections. The transverse section shews a row of blocks placed vertically. This kind of paving is composed, like the preceding, of a foundation of asphalte, the square peg or bits being fixed in this foundation alternately like a chequa-board. (See surface-view.) I also use for the foundation of this kind battens placed flat, one against the other, and pierced alternately with holes to the surface to receive the pegs or bits, which foundation is more economical than the planks mentioned in the preceding kinds. I have nevertheless shewn that it can be composed of planks; see longitudinal section. The longitudinal and transverse sections show the manner in which the pavement is put together by means of small circular discs projecting horizontally from the four angles or from the side of the blocks. The size of the disc is shewn in the block and in the small ground-plan. The surface-view shews that the surface-pegs or bits forms the alteration of a chequer-board. In order to alter-
460 nate the rods or the pegs, I arrange the holes as in a chequer-board. If I make the foundation of planks, they are grooved half an inch apart, the ridge of the first facing the hollow of the second, and so on. It will be seen by this construction that the bitumen is always protected by the small ends of the pegs or bits, and the feet of the horses find resistance and security.

The construction of these last four kinds can also be adapted to wood paving. Although I have represented the bitumen in the plans as covering three-fourths of the paving, this will only be done in those countries where bitumen is not so dear as wood. I can also arrange the

paving-blocks so as to give resistance to the feet of the horses by allowing half of the blocks to project three-quarters of an inch above the other half; I can also do this in some of the other forms.

In countries where wood is cheaper than bitumen, the lower part may be of wood; if, on the contrary, the foundation is in bitumen, the pegs ought to be inserted in an iron plate which is provided with mortices or holes sunk in the plate about three-quarters, one, or one inch and a half; this plate is adjusted in the mould according to the thickness of bitumen required. That being done, I place in the small mortices or
461 holes the pegs, which only penetrate the above-mentioned depth. When this operation is finished, the mould must be turned over in order to cast the block. This plate serves three purposes: firstly, it supports the pegs; secondly, it forms the bottom of the box; thirdly, it regulates the thickness of the bitumen surface. If wooden blocks are used the four corners should be cut off with a saw previous to the fixing of the peg or pin.

As I have stated in the preceding figures that grooves are cut in the paving, I shall here describe more particularly the way, manner, and form in which the same are to be performed. To commence with the surface of the block (see Figure 5, drawing 11), I cut grooves vertically, and always with the fibre of the wood, from one to one and a half inch deep, but I do not confine myself to any particular size; that is to say, I reserve to myself the right of leaving more or less space. In each block are cut longitudinally with the street grooves, from one-half
462 to one inch wide and about one inch deep, and transversely, grooves of the same dimensions, which form on the surface a kind of reticulation in which the bitumen is poured, and unites the whole. I make, indiscriminately, holes or channels. These holes appear at the surface somewhat similar to a plank for bottles (see Figure 6). I make another arrangement by cutting away from the faces of the blocks three-quarters or one inch of wood, which space will be afterwards filled with bitumen. I make also a surface of which half of the blocks are alternated as in a chequer-board. In order to make this kind of paving half of the blocks ought to be at least one or two inches shorter than the rest. All these blocks are pierced with holes, in which pegs
463 are driven crosswise, and which thus connects the bitumen with the wood. I can equally well connect the blocks and the bitumen by a dovetail on the four faces.

I make also another arrangement by pouring the bitumen in a mould of the same form as the blocks, the block of wood and the block of bitumen being laid down alternately as in a chequer-board; that is to say, that the block of bitumen coming from the mould will have a channel of the same form as that in the wooden block, and is to be put together with the rod of wood. To complete my systems of paving, I have adapted kennels of my own construction. They serve three distinct purposes. They serve, first, as a border to the foot-pavement; secondly, as conduits for the rain and other water; and, thirdly, they
464 carry off the mud which accumulates in the old gutters. It is easy to understand their construction from the various sections of paving, where they are represented at the two extremities. I place the kennels on a bed of masonry to maintain them perfectly even. They are cast in iron in the ordinary manner, and can be of any length, but the extremities of each length must be of an angular form, so as to jut each other.

Having now described the new and improved mode or method of and covering roads and other ways, or surfaces, I declare that

I do not claim as of the invention communicated to me the several forms or shapes of the paving-blocks of wood, granite, bitumen, asphalte, or brick, as they are already in use. But what I claim as the invention is—

465 First. The mode or method of preparing the ground by a layer of sand for the wooden, and combined wood and granite, wood and brick, asphalte, bitumen kinds of paving, as I have before described.

Secondly. The mode of combining the several forms of wooden blocks, also of wooden blocks with granite, and wooden blocks with brick, asphalte, or bitumen blocks, as I have before described.

Thirdly. The mode of combining wooden blocks with bitumen and asphalte, to form paving-blocks, in such proportions as to allow for their expansion and contraction, as I have before described.

Fourthly. The mode of uniting, jointing, and supporting the paving-blocks by means of rods, pegs, nuts, or keys, so that every block is jointed, consolidated, and supported by the adjacent one, and each row of blocks forms a whole along the transverse section of the way, as I have before described.

466 Fifthly. The mode of constructing moveable keys, by means of which any part of the surface can be raised, in case of need, and replaced without permanently deranging the paving-blocks or the surface itself, as I have before described.

Sixthly. The mode of grooving or preparing the wooden paving-blocks with cement, mastic, bitumen, asphalte, marine glue, and India rubber, to prevent the horses from slipping, as I have before described.

And such the invention being, to the best of my knowledge and belief, entirely new and never before used within that part of Her said Majesty's United Kingdom of Great Britain and Ireland called England, her said dominion of Wales and town of Berwick-upon-Tweed, I do hereby declare this to be the specification of the same, and that I do

467 verily believe that this specification doth comply in all respects fully and without reserve or disguise with the proviso in the said hereinbefore in part recited letters patent contained; wherefore I hereby claim to maintain exclusive right and privilege to the said invention.

In witness whereof I, the said Peter Armand le Comte de Fontainemoreau, have hereunto set my hand and seal this fifteenth day of November, in the year of our Lord one thousand eight hundred and forty-four.

P. DE FONTAIN'MOREAU. [L. S.]

And be it remembered that on the same fifteenth day of November, in the year above mentioned, the aforesaid Peter Armand le Comte Fontain'moreau came before our lady the Queen, in her chancery, and

468 acknowledged the specification aforesaid, and all and everything therein contained, in form above written. And also the specification aforesaid was stamped according to the tenor of the statute in that case made and provided.

Inrolled the same fifteenth day of November, in the year above written.

R. RICHARDS.

(Here follows two diagrams.)

469 *Def'ts Ex. No. 22, E. G. T., S. E., Jan'y 20, '71.*

A. D. 1846. No. 11,466.

PAVING STREETS, &C.

Love's specification.

To all to whom these presents shall come: I, Richard Love, junior, of Coleman street, in the city of London, merchant, send greeting:

Whereas Her present Most Excellent Majesty Queen Victoria, by her royal letters patent, under the great seal of Great Britain, bearing date at Westminster, the first day of December, in the tenth year of her reign, did, for herself, her heirs and successors, give and grant unto me, the said Richard Love, her especial license, full power, sole privilege and authority, that I, the said Richard Love, my executors, administrators, and assigns, and such others as I, the said Richard Love, my executors, administrators, or assigns, should at any time agree with, and no
470 others, from time to time, and at all times during the term of years therein mentioned, should and lawfully might make, use, exercise, and vend, within England, Wales, and the town of Berwick-upon-Tweed, and in all Her Majesty's colonies and plantations abroad, and in the islands of Jersey, Guernsey, Alderney, Sark, and Man, my invention of "certain improvements in paving strets, roads, yards, and other surfaces over which carriages and beasts of burden have to pass"; in which said letters patent is contained a proviso obliging me, the said Richard Love, by an instrument in writing, under my hand and seal, particularly to describe and ascertain the nature of my said invention, and in what manner the same is to be performed, and to cause the same to be enrolled in Her Majesty's high court of chancery, within six calendar months next and immediately after the date of the said in part recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear:

471 Now know ye, that in compliance with the said proviso, I, the said Richard Love, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, is particularly described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the letters and figures marked thereon, that is to say:

My invention of improvements in paving streets, roads, yards, and other surfaces over which carriages and beasts of burden have to pass, consists in forming the pavement of a combination of wood and stone, which materials are arranged in such a manner that the wood by swelling may be made to hold the wood firmly, and form a compact, strong, and durable paving, free from the objections that are incidental to paving constructed of either of the above materials alone.

It will be evident to any person conversant with the subject that the object of my invention can be effected in various ways, and that the mode of carrying out my improvements must in some measure
472 depend upon the circumstances of each particular case, and may with advantage be left to the discretion of the parties who intend to make use of my invention.

In order, however, to prevent misconception, and that the nature of my improvements may be clearly understood, I have shown, in the accompanying drawing, a plan combining wood and stone, which will be found to answer the purpose exceedingly well.

Figure 1 represents a sectional view, and figure 2 a plan view of a piece of paving constructed according to my improved plan. *a a a a* are blocks of stone of the ordinary shape and size, and such as are usually employed for paving; and *b b b b* are thin slips or narrow blocks of wood, from half an inch to two inches in width, and placed between the rows of stone blocks. The slips or narrow blocks of wood may be employed in the natural or unprepared state; but I prefer to have them prepared for the purpose to which they are intended to be applied, either by drying them by means of heat in stoves, or by currents of heated air, as is well known, or by compressing them under heavy pressure.

473 The object of thus drying or compressing the slips or blocks of wood previous to using them for paving is to reduce their bulk, so that when they are placed beside the stone blocks in the paving the wood, when made to swell by the moisture it will imbibe from the earth, the atmosphere, or otherwise, will pack closely and hold tightly against the stone, and form a compact and solid mass of paving. Another important advantage resulting from the employment of wood and stone in combination is that there is a degree of elasticity imparted to the paving by placing rows of wood and stone alternately, and the noisy and destructive jar incidental to all paving constructed entirely of stone is in a great measure obviated, and the paving consequently rendered much more durable.

Various descriptions of wood are applicable for the above purpose, but the particular kind to be used will of course depend upon a variety of circumstances, such as the nature of the road, the amount of traffic expected, and the costs of different kinds of wood in the localities where the pavement is to be laid down; but I have found well-dried soft

474 woods, such as fir, American willow, and poplar, to answer the intended purpose remarkably well, as these woods retain their moisture in dry weather, and therefore are not so liable to split or contract, and allow the paving-stones to become loose, as some others of a harder kind.

I may here remark that I do not propose to make any alteration in the mode of forming the foundation of the road, nor to dispense always with the use of concrete, which may, if required, be employed to give greater solidity to the road when constructed, and, if thought advisable, the wooden slips or blocks may (previous to using them for paving) be subjected to any of the known processes for preserving wood from decay; but these points being questions of expense, and not at all effecting the principle of the invention, I leave them entirely discretionary.

I would also observe that, if thought desirable, thin slips or blocks of wood may be placed between the stones composing each row, so that no stone may be found in contact with another stone; but when this arrangement is adopted the wood block employed for this purpose must not be compressed, or too dry, or such as will expand to too great a degree after they are laid down, as otherwise this lateral expansion may produce the effect of dislocating the paving or forcing the curb-stones out of their places.

475 It will be evident to any practical pavior that many advantages besides those enumerated will result from combining wood and stone so as to form a paving in the manner hereinbefore set forth; and it will be seen that by making the slips or blocks of wood thin or narrow, in comparison to the width of the stone blocks, the former do not constitute any very considerable portion of the wearing surface of the pavement, and consequently a pavement constructed upon my improved

plan will not be open to the objections incidental to all description of wood-paving.

Having now described my invention, and the manner of carrying the same into effect, I would observe, in conclusion, that I do not mean to confine myself to the precise arrangement, combination, or dimension of parts hereinbefore set forth and described, as the same may be considerably varied without departing from the nature and object of my invention; but what I consider to be new, and therefore wish to secure under the hereinbefore in part recited letters patent, is, the introduction of thin or narrow slips or blocks of wood between the blocks of stone usually employed for paving, or any others applicable to a similar purpose, so that when the said slips or blocks of wood are moistened by exposure to wet or a damp atmosphere they may be made to expand, and by packing closely against the stones will firmly hold them, and render the whole a compact and solid mass of paving.

476

In witness whereof I, the said Richard Love, have hereunto set my hand and seal, this first day of June, in the year of Lord one thousand eight hundred and forty-seven.

RICHARD LOVE, JUNIOR. [L. S.]

And be it remembered, that on the same first day of June, in the year above mentioned, the aforesaid Richard Love, junior, came before our lady the Queen, in her chancery, and acknowledged the specification aforesaid, and all and everything therein contained, in form above written.

And also the specification aforesaid was stamped according to the tenor of the statute in that case made and provided.

Inrolled the first day of June, in the year above written.

N. W. SENIOR.

(Here follows diagram.)

477 *Def't's Ex. No.* 23., *E. G. T., S. E., Jan'y* 20, '71.

A. D. 1849. No. 12761.

PAVEMENT.

Hosking's specification.

To all to whom these presents shall come, I, John Hosking, of Newcastle-upon-Tyne, in the county of Northumberland, engineer, send greeting:

Whereas her present Most Excellent Majesty Queen Victoria, by her royal letters patent, under the great seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster the sixth day of September, one thousand eight hundred and forty-nine, in the thirteenth year of her reign, did, for herself, her heirs, and successors, give and grant unto me, the said John Hosking, my ex'ors, adm'ors, and assigns, her especial license, full power, sole privilege, and authority that I, the said John Hosking, my ex'ors, adm'ors, and assigns, or such others as I, the said John Hosking, my ex'ors, adm'ors, or assigns, should at any time agree with, and no others, from time to time, and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend within England, Wales, and the town of Berwick-upon-Tweed my invention of "an improved pavement"; in which said letters patent is contained a proviso

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that I, the said John Hosking, shall cause a particular description of the nature of my said invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, to be inrolled in Her Majesty's high court of chancery within six cal-
479 endar months next and immediately after the date of the said in part recited letters patent, as in and by the same, reference being thereunto had, will more fully and at large appear:

Now know ye that, in compliance with the said proviso, I, the said John Hosking, do hereby declare the nature of my invention to consist in forming the foundation of a roadway, street, or floor of a pavement consisting wholly of blocks of wood, or blocks of other materials combined with those of wood, some or all of which blocks have upon their upper surface a projecting piece formed somewhat like the tooth or cog of a wheel, and in filling the channels which surround such teeth with blocks of stone, concrete, or asphalte previously prepared to fit the space left between block and block, and so as to project above the teeth or cogs, and thereby become the wearing-surface of my improved pavement; or such channels or spaces may be filled with asphalte,
480 concrete, or any other material in a fluid state, until the entire surface of the pavement is covered with it as a wearing-surface, whereby the cementing material and the foundation become one compact and solid mass, in which the advantages resulting from a macadamized road and from a wood pavement are combined, whilst some of the disadvantages arising from each separately are avoided.

Description of the drawing.—Figure 1 represents in perspective a mode in which three different forms of blocks are arranged for a foundation for my improved pavement. Figure 2 represents in perspective a mode in which two different forms of blocks are arranged for the same purpose as in figure 1.

Figure 3 represents in perspective a mode in which blocks of the same shape are arranged for the same purpose as those in fig-
481 ure 1, and figure 4 represents in section some of the blocks in figure 1, with the foundation and covering completed, and thus combined forming my improved pavement.

In Figure 1, *b* represents a block made of wood, tile, or any other suitable material placed on the ground, which has been levelled or curved for the purpose, or on planking of wood or concrete, the surface of which is either in a plane or curved.

This block *b* has longitudinal and transverse holes intersecting each other for the purpose of drainage; *a* represents a block of brick, wood, or other suitable material, the overhanging shoulders of which rest on the project-ing shoulders of the blocks *b* on each side, and keep them a distance apart from each other.

These blocks *a* are placed at such distances from each other in
482 the same channel as to admit of the blocks *c* (which are of wood) being passed down between them until the shoulders of the blocks *c* rest on those of the blocks *b* and fill the spaces between them, whilst it leaves the upper portion of the blocks *c* projecting above the surface of the blocks *a* and *b* in *in* the form of teeth, with a space around each tooth, to be filled either with [here follows diagram] hewn stone or loose stone and cements, or with asphalte, or any of the materials well known in road-making, and used in a semi-fluid state.

In Figure 2, *b b* are blocks similar to those described in Figure 1, of either wood, brick, or any other suitable material, with openings in them for drainage; and *d d* are blocks of wood, which, when combined with those of *b b*, form a pavement with a number of teeth or cogs on

its surface and channel surrounding them which are to be filled
483 with similar materials and in a similar manner to those described in Figure 1.

In Figure 3, *e e* are blocks of the same shape arranged together for a pavement so as to have projecting teeth or cogs on its surface and channels surrounding them, which are to be filled with similar material and in a similar manner to those described in Figure 1.

In Figure 4, *b* and *c* represents a section of the blocks shewn in Figure 1, arranged together and combined by the filling in and subsequent covering of asphalte, *f*, according to my invention.

When such foundations for pavements have been made for roadways, streets, or floors, and the filling in between and covering over the teeth in the manner described has been accomplished, the projecting teeth prevent the superimposed material from being shifted about, or
484 from becoming broken into loose fragments, and it is thereby secured against that continually grinding action which is the principal cause of wear and dust. Pavements made in the manner I have described are productive of less noise when travelled over than those made entirely of mineral products, and have the advantage also of being less slippery than those which have a surface formed wholly or almost wholly of wood.

Having now described the nature of my invention, and in what manner I carry the same into effect, I declare that I do not claim any of the parts separately, nor the precise form or dimension of the blocks I have shewn. But what I do claim as of my invention is the construction of a pavement having a foundation made wholly or in part of wood,
485 having teeth projecting upwards from the general surface, and surrounding and covering those teeth with asphalte, or any of the materials I have described, or which are in general use for the surface of pavements of a like kind.

In witness whereof, I, the said John Hosking, have hereunto set my hand and seal this fifth day of March, one thousand eight hundred and fifty. JOHN HOSKING. [L. S.]

486 And be it remembered that on the fifth day of March, in the year of our Lord 1850, the aforesaid John Hosking came before our said lady the Queen, in her chancery, and acknowledge' the specification aforesaid and all and everything therein contained and specified in form above written.

And also the specification aforesaid was stamped according to the tenor of the statute made for that purpose.

Enrolled the fifth day of March, in the year of our Lord one thousand eight hundred and fifty.

JEFFERSON.

487 *Defendant's Exhibit* 41.—*Translation.*

Description of machines (mechanical contrivances) and processes published in "patents, improvements, and importations," the terms (duration) of which are expired, and the expiration of which have been declared; published by order of the minister of the interior, agriculture, and commerce. Volume LXXVIII. Paris, XXX, 1852.

10869.

(Page 346.)

Patent of (for) ten years. Date, 26 September, 1842. To M'r Hediard (Alexander), Paris. For a system of wooden (block) paving (pavement.)

After this new plan, the paving material will be of single pieces of wood, cut slanting downwards on the sides (beveled), and applicable (suitable) to every kind of paving (pavement).

The paving (block) may be of any length and depth.

The size and shape of the paving (block) which we most (generally) use is the following:

488 The upper face will be a perfect square with grooves; each of the four sides of this face will be $0^{m}.108$.

The bottom of the paving (block), or the lower face, which should be paral'el to the upper face, will be an oblong square, and will be $0^{m}.162$ in length by $0^{m}.054$ in breadth.

The depth of the paving (block) comprised between the upper and lower faces will be $0^{m}.068$.

As to the upper face of the paving (block), the two beveled edges (or ends) on the two opposing or opposite sides will emerge from the bottom $0^{m}.027$ each, and the two beveled edges or (ends) on the other two sides opposite will descend to the lower part or bottom $0^{m}.027$ each.

489 It will be the same for paving (blocks) having more than four sides; they will alternate, that is to say, that the beveled edges (or ends) applied to the two opposing or opposite sides should be placed or inserted vertically; two other beveled edges (or ends), applied to two other sides also opposed or opposite, will descend verticaliy, and so on.

The paving (blocks) so cut will dovetail (or interlace) one with the other in such a fashion (or manner) that each beveled edge (or end) emerging will always correspond with (or apply to) another beveled edge (or end) descending.

By this disposition (or arrangement) they will be joined (or clamped) with precision and present an indefinite resistance above or below.

490 The beveled edges or ends may vary in size.

This pavement will be applicable to (or suit) streets, avenues (boulevards), bridges, roads, sidewalks, courts (or yards), flooring for rooms, &c.

The paving (blocks) may be made of peices of wood cut in various shapes, and they can be secured and made with all kinds of wood.

It is optional either to tar (the blocks or pieces), to saturate them in a preparation of mercury, or in any other material or composition suitable to the preservation of wood.

491 The direction and number of the grooves (furrows) may be varied at will.

The demensions of each piece of wood may also at will be changed (varied) on every side and face, as well as the beveled edges (or ends). (See Pl. 17^{c}, Fig's 1st, 2nd, 3rd, & 4th.)

28TH SEPTEMBER, 1842.

First amendment & improvement.

Fig. 5^{e}, 6^{e}, 8^{e}.—The upper face of the paving (blocks) will be an oblong square with grooves (furrows.)

Each of the two larger sides of this square will have a length of $0^{m}.216$. Each of the smaller sides will have a length of $0^{m}.108$.

492 The bottom or lower face of the paving (block)—the surface of which will be paral'el*l* to that of the upper side—will also present an oblong square, the larger sides of which will each be $0^{m}.216$ in length, and the smaller sides of which will each be $0^{m}.108$.

The depth of the paving (block), comprised between the upper and lower faces, will be $0^{m}.108$.

Each of the two extremities of the paving (block) should be cut bevel-edged, which will form two bevel-edges (or ends), one of which will go, in descending, from the upper to the lower face of the paving (block), and the other will go, in ascending, from the upper to the lower face (surface).

493 The projection of each bevel-edge (or end), or the quantity of each one which will rise in the order which has just been described—that is to say, one with reference to the upper face, the other with reference to the lower face, will be $0^{m}.054$.

In this way the paving (block), extending by one or the other of the lateral faces of the two large sides, will present a parallelogram, the sides taken two and two being equal, and the opposite angle being, two and two, obtuse and acute.

494 The section of the two extremities offering (presenting) two parel'el*l* surfaces, will present a profile arranged as thus:

The section of paving (block), through the whole length of one of its sides, will decline vertically from the upper surface of the paving (block) down to one-half of its thickness; there the paving (block) will present a horizontal section of $0^{m}.027$ in depth throughout the length of the side, and this section will continue regularly to the bottom of the paving (block).

495 The section of paving (block), throughout the length of the other large side, will rise vertically from the bottom of the paving (block) up to half its thickness; then the paving (block) will present a horizontal section of $0^{m}.027$ in depth (or thickness) throughout the length of this side, and this section will continue regularly up to surface of the paving (block); that is to say, the paving (block) being in its natural (normal) position, one section will occupy all the lower half throughout the length of the large side, and the other section all the upper half of the other large side.

496 By this means the paving (blocks) will be supported by (or lean upon) each other, namely, at the two extremities, by the beveled edges (or ends), and the two sides by the profiles in projection, in such a manner that they will interlace, one beveled edge (or end) descending, will always support (or rest upon) another beveled edge (or end), ascending, and each lateral projection will bear or rest upon a lateral recess (or indentation).

The beveled edges (or ends), whether projecting or receding, may vary

in size, as well as the paving (block) itself, throughout their dimensions, (regard being had) to the number and shape of the grooves; and
497 likewise they may be mutually supported by (or rest upon) each other without other device, or by the application of wooden or metal pins or bolts.

5TH OCTOBER, 1842.

Second amendment and improvement

Fig. 8e, 9e, 10e.—The upper face or surface of the paving (block) will have a total length of 0m.216; its length, from the extremity where the beveled edge (or end) enters (or appears), in re-entering vertically as far as the half of the total length, will be 0m.080, and throughout
498 every other half of the same length the breadth will have a regular increase (addition) of 0m.070 on the whole, one-half of which on each side of the paving (block.)

In this fashion the whole surface of the paving (block) will present a plane forming two oblong squares contiguous, the dimensions of which will be, namely, for (of) the smallest square 0m.108 in length and 0m.080 in breadth, and for (of) the large square 0m.120 in length and 0m.108 in breadth. This increase (addition) in breadth, equally divided on (between) the two sides, will be found by the two parts in projection
499 or relief, contrived (arranged) on the two sides of the paving (block) as will (now) be stated (or described).

The lower (or under) face of the paving (block) will present a plane also forming two oblong squares like (similar) to those of the upper face (or surface), but in an inverse order.

The parts in projection, which determine the increase (addition) in breadth already pointed out, are so formed that, on each side of the lateral faces of the two large sides of the paving (block) (each of which presents a parallelogram (plane) described in the preceding memorial), two regular projections or reliefs are arranged, each presenting a lit-
500 tle parallelopiped, having a length equal to the half of the paving (block), a heigth equal to the half of the depth of the paving (block) comprised between the two upper and lower faces (or surfaces) of the paving (block), and a depth of 0m.080.

There are, then, altogether, four of these projections or reliefs contrived (arranged) to each paving (block), namely, two to each of the lateral faces of one of the large sides of the paving (block), and two of the other lateral face of the opposite side.

The two projections contrived (arranged) to the same side of the paving-block will be each paral'el, to the plane of the same side, the plane which each one presents being itself like to that of the large side of the paving (block) upon which they are contrived (arranged),
501 but they are arranged on each side of the paving (block) in the following fashion:

1st. So that one joins (unites with) the large side of the paving (block), leaning towards the upper extremity of the paving (block), from whence the beveled-edge end goes (passes) in emerging vertically, where it fits or lies close to the paving (block), without rising or overtopping above the upper part or side of the beveled edge or end.

2nd. So that the other joins (or unites with) the same large side of the paving (block), leaning towards the lower extremity of the paving (block), from whence the beveled edges or ends go in rising (emerging) from bottom to top, and where it fits (or lies close to) the paving (block),

The demensions of each piece of wood may also at will be changed (varied) on every side and face, as well as the beveled edges (or ends). (See Pl. 17^{c}, Fig's 1st, 2nd, 3rd, & 4th.)

28TH SEPTEMBER, 1842.

First amendment & improvement.

Fig. 5^{e}, 6^{e}, 8^{e}.—The upper face of the paving (blocks) will be an oblong square with grooves (furrows.)

Each of the two larger sides of this square will have a length of $0^{m}.216$. Each of the smaller sides will have a length of $0^{m}.108$.

492 The bottom or lower face of the paving (block)—the surface of which will be paral'el*l* to that of the upper side—will also present an oblong square, the larger sides of which will each be $0^{m}.216$ in length, and the smaller sides of which will each be $0^{m}.108$.

The depth of the paving (block), comprised between the upper and lower faces, will be $0^{m}.108$.

Each of the two extremities of the paving (block) should be cut bevel-edged, which will form two bevel-edges (or ends), one of which will go, in descending, from the upper to the lower face of the paving (block), and the other will go, in ascending, from the upper to the lower face (surface).

493 The projection of each bevel-edge (or end), or the quantity of each one which will rise in the order which has just been described—that is to say, one with reference to the upper face, the other with reference to the lower face, will be $0^{m}.054$.

In this way the paving (block), extending by one or the other of the lateral faces of the two large sides, will present a parallelogram, the sides taken two and two being equal, and the opposite angle being, two and two, obtuse and acute.

494 The section of the two extremities offering (presenting) two parel'el*l* surfaces, will present a profile arranged as thus:

The section of paving (block), through the whole length of one of its sides, will decline vertically from the upper surface of the paving (block) down to one-half of its thickness; there the paving (block) will present a horizontal section of $0^{m}.027$ in depth throughout the length of the side, and this section will continue regularly to the bottom of the paving (block).

495 The section of paving (block), throughout the length of the other large side, will rise vertically from the bottom of the paving (block) up to half its thickness; then the paving (block) will present a horizontal section of $0^{m}.027$ in depth (or thickness) throughout the length of this side, and this section will continue regularly up to surface of the paving (block); that is to say, the paving (block) being in its natural (normal) position, one section will occupy all the lower half throughout the length of the large side, and the other section all the upper half of the other large side.

496 By this means the paving (blocks) will be supported by (or lean upon) each other, namely, at the two extremities, by the beveled edges (or ends), and the two sides by the profiles in projection, in such a manner that they will interlace, one beveled edge (or end) descending, will always support (or rest upon) another beveled edge (or end), ascending, and each lateral projection will bear or rest upon a lateral recess (or indentation).

The beveled edges (or ends), whether projecting or receding, may vary

in size, as well as the paving (block) itself, throughout their dimensions, (regard being had) to the number and shape of the grooves; and
497 likewise they may be mutually supported by (or rest upon) each other without other device, or by the application of wooden or metal pins or bolts.

5TH OCTOBER, 1842.

Second amendment and improvement

Fig. 8e, 9e, 10e.—The upper face or surface of the paving (block) will have a total length of 0m.216; its length, from the extremity where the beveled edge (or end) enters (or appears), in re-entering vertically as far as the half of the total length, will be 0m.080, and throughout
498 every other half of the same length the breadth will have a regular increase (addition) of 0m.070 on the whole, one-half of which on each side of the paving (block.)

In this fashion the whole surface of the paving (block) will present a plane forming two oblong squares contiguous, the dimensions of which will be, namely, for (of) the smallest square 0m.108 in length and 0m.080 in breadth, and for (of) the large square 0m.120 in length and 0m.108 in breadth. This increase (addition) in breadth, equally divided on (between) the two sides, will be found by the two parts in projection
499 or relief, contrived (arranged) on the two sides of the paving (block) as will (now) be stated (or described).

The lower (or under) face of the paving (block) will present a plane also forming two oblong squares like (similar) to those of the upper face (or surface), but in an inverse order.

The parts in projection, which determine the increase (addition) in breadth already pointed out, are so formed that, on each side of the lateral faces of the two large sides of the paving (block) (each of which presents a parallelogram (plane) described in the preceding memorial), two regular projections or reliefs are arranged, each presenting a lit-
500 tle parallelopiped, having a length equal to the half of the paving (block), a height equal to the half of the depth of the paving (block) comprised between the two upper and lower faces (or surfaces) of the paving (block), and a depth of 0m.080.

There are, then, altogether, four of these projections or reliefs contrived (arranged) to each paving (block), namely, two to each of the lateral faces of one of the large sides of the paving (block), and two of the other lateral face of the opposite side.

The two projections contrived (arranged) to the same side of the paving-block will be each paral'el, to the plane of the same side, the plane which each one presents being itself like to that of the large side of the paving (block) upon which they are contrived (arranged),
501 but they are arranged on each side of the paving (block) in the following fashion:

1st. So that one joins (unites with) the large side of the paving (block), leaning towards the upper extremity of the paving (block), from whence the beveled-edge end goes (passes) in emerging vertically, where it fits or lies close to the paving (block), without rising or overtopping above the upper part or side of the beveled edge or end.

2nd. So that the other joins (or unites with) the same large side of the paving (block), leaning towards the lower extremity of the paving (block), from whence the beveled edges or ends go in rising (emerging) from bottom to top, and where it fits (or lies close to) the paving (block),

502 without overreaching or overtopping either the lower part or side of the beveled edge (or end).

The disposition (or arrangement) of the sections (or projections) on the other side of the paving (block) is the same.

9 NOVEMBER, 1842.

Third amendment and improvement.

Fig. 11e.—The bed of the street, as in my preceding claims (applications), will be rammed (or rolled); after which a layer of sand $0^m.08$ in depth will be placed, which, after having been watered, will, as also the soil (or foundation), be strongly (heavily) rammed and levelled.

503 Upon the sand so prepared is laid a foundation (flooring) of wood composed of little boards (or planks) $0^m.60$ in length, by $0^m.08$ in breadth and $0^m.02$ thick.

These little boards (or planks) will be — as I have pointed out in my designs—laid down flat on the sand and securely fastened, in such a manner that the length of the little boards (or planks) will be lengthwise the street.

The paving (blocks) will be of a single piece, in blocks of wood; they will form an oblong square; they will be $0^m.14$ high in perpendicular by $0^m.22$ or $0^m.23$ broad; their depth will be $0^m.08$.

504 They will be placed (or laid) on the wood foundation (or flooring), transversely to the small boards (or planks), and consequently they will cross the latter, and their length will be crosswise the street.

They will all be placed (or laid) side by side at a distance of $0^m.01$, and in such a manner (or position) that two angles will always face the central part (or point) of the next block.

This interval (or intervening space) of $0^m.01$ between each paving (block) will be filled in with a well prepared cement or mastic, the latter of which, besides being of a solidity (or consistency) to stand any test or proof, possesses an immense advantage in preventing horses from slipping in rainy (or bad) weather.

9 DECEMBER, 1842.

Fourth amendment and improvement.

505 The bed of the street will be (first) rammed (or rolled), then a layer of sand of $0^m.08$ in depth, which, after having been watered as also the soil, will be strongly (heavily) rammed (or rolled) and levelled.

I reserve the right to replace (or substitute for) the foundation of wood, a layer of concrete.

Upon the sand so prepared, a foundation of wooden boards (or planks), $0^m.60$ in length by $0^m.02$ in thickness, is laid.

These boards (or planks) will be laid down flat on the sand and securely fastened so that their length will be lengthwise the street.

Fig. 12e, 13e, 14e.—The paving (material) will be single pieces of wooden blocks; they will be $0^m.12$ high in perpendicular by $0^m.22$ in breadth; their depth will be $0^m.08$.

506 They will be placed (or laid) on the wooden foundation (or flooring) transversely to the boards (or planks), and consequently they will cross the latter; that is to say, their length will be crosswise the street.

They will be placed side by side to each other, and in such a manner (or way) that two angles will always face the central part (or point) of the next block.

They will be supported by one another by means of one or two little keys (or tongues) of galvanized iron $0^m.001$ in depth and $0^m.04$ square, which will be introduced into a notch or groove made with a saw $0^m.02$ in depth, contrived (arranged) on the two large lateral faces (or surfaces) of each paving (block), $0^m.07$ from the upper face (or surface), and $0^m.05$ from the lower face (or surface).

15 OCTOBER, 1844.

Fifth amendment and improvement.

Fig. 15ᵉ.—The bed of the street, as in my preceding claim, will be rammed (rolled) & levelled, and recovered with a thick layer of beton.

507 The paving (material) will be composed of small pieces of blocks of wood placed at an equal distance from each other—about $0^m.015$, which will be filled in with asphalt.

They will be cast (or formed) in moulds, consequently they will be perfectly regular (even); they will present the form (or shape) of an oblong square $0^m.30$ in length, $0^m.15$ in width, by a depth of $0^m.05$.

The paving (blocks) may be varied in form and size.

508 They will be independent of (separate from) one another; but, after having been well wedged in, they will be securely sealed (fastened down) with cement, or any other mastic, on the bed of concrete.

Wooden (block) pavement by M'r Hediard.

In the original, here follows plate 17, containing 15 figures, being diagrams or designs presenting the various shapes & sizes of the paving-blocks & pavement herein described.

A. P. M., *Translator.*

WASHINGTON, D. C., 24 *Jan.*, '78.

NICOLSON'S ORIGINAL AND REISSUED PATENT.

ORIGINAL PATENT.
August 8, 1854.

To all to whom these presents shall come :

Be it known that I, Samuel Nicolson, of Boston, in the County of Suffolk, and State of Massachusetts, have invented a new and usefnl improvement in wooden pavements, and I do hereby declare that the same is fully described and represented in the following specification, and the accompanying drawings, letters, figures, and references thereof :

REISSUE.
August 20*th*, 1867.

To all whom it may concern :

Be it known that the following is a full, clear, and exact description of the new and useful improved Wooden Pavement, invented by me, Samuel Nicolson, of Boston, in the State of Massachusetts, and for which Letters Patent were granted to me on the eighth day of August, in the year of our Lord one thousand eight hundred and fifty-four, and for which new and Reissued Letters Patent were granted to me on the first day of December, in the year of our Lord one thousand eight hundred and sixty-three ; the said last-mentioned Letters Patent having been surrendered for the purpose of describing the same invention, and pointing out in what it consists, in more clear, full, and exact terms than was done in the said original or amended specifications.

The nature and object of my invention consists in providing a process or mode of constructing Wooden Block Pavements upon a foundation along a street or roadway, with facility, cheapness, and accuracy, and also in the creation and construction of such a Wooden Pavement for streets and roadways as shall be comparatively permanent and

durable, by so uniting and combining all its parts, both superstructure and foundation, as to provide against the slipping of the horses' feet, against noise, against unequal wear, and against rot on or from the top surface, and against rot and consequent sinking away from below.

For a clear understanding of the manner of constructing my Improved Wooden Pavement, I refer to the accompanying drawings, with corresponding letters of reference, making part of these specifications, of which drawings :

Of the said drawings, figure 1 represents a top view of my improved pavement.

Figure 2 is a transverse and vertical section of it.

No. 1, Figure 1, represents a top view of the first plan of said pavement, and

Figure 2, of the same drawing, represents a transverse and vertical section of the same ; and

Figure 1, of drawing No. II, represents a perspective view of the said pavement, constructed and in the process of construction, after the second plan or modification ; and

Figure 2, drawing No. II, a further perspective view of a section of the said pavement on the first plan, and

Figure 3, drawing No. II, a further perspective view of a section of the said pavement on the second plan.

In carrying out my invention, I make use of two sets or series, *a*, *a*, *a*, *b*, *b*, *b*, of wooden blocks. They are cut from joist, or timber four inches square, or of other suitable dimensions, in cross sections ; the longer blocks, *a*, *a*, *a*, being made about eight inches in length, while the shorter blocks,

In further carrying out my invention, I employ two (2) sets of blocks, or a set of blocks and strips. The one set of blocks, which may be called the principal set of blocks, forms, when the pavement is completed, the wooden surface of the pavement, and the other or auxiliary set

or those represented at *p*, *p*, *p*, are formed about half the length of the others. These blocks are placed end upwards, and are arranged both transversely and longitudinally, so that the long and short blocks shall be arranged alternately in each direction, or run as seen in the drawings.

Such an arrangement of them leaves cells or cavities, *c*, *c*, *c*, between the said blocks, each of the said cells being bounded by four of the larger blocks, and having its bottom formed by one of the shorter blocks. The of blocks or strips forms no part of the wooden surface of the pavement, but determines the size of the groove or channel-way between the principal blocks, which is afterwards to be filled with broken stone, gravel, and tar. While the principal set of blocks must be of uniform height, and of suitable texture to form a proper surface for the pavement, the auxiliary set need be of no particular height or texture, but they must not permanently and entirely fill the grooving intended for the gravel, broken stone, and tar, when the pavement is completed.

The principal set of blocks is cut with parallel sides, lines, or surfaces, from joist or timber about four inches square, or of other suitable shape and dimensions, in cross-sections, being made eight inches in length. The auxiliary blocks may be formed of about half the length of the others, but they must be of such thickness or cross-section as to form the proper boundary of the groove.

The principal blocks are placed end upwards upon said foundation or support, and are arranged both transversely and longitudinally, so that the principal and the auxiliary blocks shall be arranged alternately in each direction, or run as seen in the drawings. By such an arrangement spaces or cells, *c*, *c*, *c*, between the principal blocks are formed, each of said cells being bound by four of the principal blocks. The upper ends of the principal blocks, when thus placed together, present a checkered or

upper surfaces of the long blocks when thus placed together present a chequered or tesselated appearance, and they well exhibit the open space or cells arranged together in a similar manner.

Into each of these cells, a small quantity or layer of coarse salt may be put, and the cells filled up with small broken stone or coarse gravel, the whole being firmly rammed so that the upper surface of the mass in each cell shall be firm and level. Next, mineral or vegetable tar or pitch is to be poured over the whole surface of the pavement, and into the cells or cavities containing the broken stone or gravel, so as to penetrate entirely between the pieces of stone or gravel and cement them together. The tar permeating into the squares containing the broken stone will cause the masses of the same to adhere firmly to the surrounding blocks, and will admit of expansion of the mass by the weight of the wheels of carriages in passing over them—such expansion serving to fill up such space as might otherwise be made by shrinkage of the wooden blocks.

In order to prevent the blocks from being forced below one another, they may be pinned together with wooden pins, extending from block to block.

tesselated appearance, and they will exhibit the open spaces arranged together in a similar manner. Into each of these cells a small quantity or layer of coarse salt may be put. These cells are filled up with small broken stone, or coarse, clean gravel, the whole being firmly rammed, so that the upper surface of the mass shall be firm and level.

Next, mineral or vegetable tar or pitch is to be poured over the whole surface of the pavement, and into the cells or cavities containing the broken stone, or gravel, so as to penetrate entirely between the pieces of stone, or gravel, and cement them together. The tar penetrating into the squares containing the broken stone or gravel, will cause the masses of the stone to adhere firmly to the surrounding blocks, and will admit of expansion of the mass by the weight of the wheels of carriages in passing over them, such expansion serving to fill up the space which might otherwise be made by shrinkage of the wooden blocks.

In order to prevent the blocks from being forced below one another in some of my modes of constructing the pavement, they may be pinned together with wooden pins, extending from block to block.

Instead of the broken stone and tar, any other suitable cementing materials or cement may be employed in the cells. I prefer, however, common tar or pitch, and gravel or broken stone, as such in practice has been found to operate to great advantage, and to be very durable in use, and to present a surface over which it is very difficult for a horse's foot to slip or slide, as it will on the ordinary wooden pavement when its surface is wet or covered with mud.

The smaller blocks, *p*, *p*, serve to hold the masses of cement and stone in the cells, and when such masses are compacted by any blows upon them, or the rolling of wheels over them, instead of being pressed down so as to slide down between the blocks, they are made to spread laterally, and thereby completely close up the joints between the blocks and themselves, and so as to prevent water from passing down into the joints between the blocks. As the salt will slowly melt, it will penetrate into the wood and aid in preserving it from decay.

The earth upon which the pavement is to rest may be prepared to receive the pavement by covering its surface with tarred paper, or other preventive to moisture being absorbed from the ground by the wooden blocks.

My invention may be carried out in another form, that is to say, the long blocks may be arranged side by side, and in rows, transversely of the roadway, and with spaces about one inch in

Instead of the broken stone and tar, any other suitable cementing material may be employed in the cells. I prefer, however, common tar or pitch, and gravel or broken stone, as such in practice has been found to operate to great advantage, and to be very durable in use, and to present a surface on which it is very difficult for horses to slip or slide, as is frequently the case in ordinary pavements when the surface is wet or covered with mud.

My invention may be carried out in another form, that is to say, upon the plan or second modification seen in fig. 1, and fig. 3 of drawing No. II. The principal blocks are arranged

thickness between each two rows of them, in each of which spaces a strip of board may be introduced, the width of the board being equal to about half the length of the block. These boards being made to rest on the surface of the ground, create, with the rows of the blocks, long cells or grooves extending transversely across the roadway, such cells or grooves being subsequently filled with broken stone or gravel, and tar or cement. I do not, however, consider this method of carrying it out, my invention, of so much value as the first, on account of the broken stone and tar or cement not being arranged between the blocks in longitudinal as well as transverse directions.

In order to prepare the earth of the roadway for the reception of my improved pavement, instead of employing tarred paper as above described, the upper surface of the roadway, after being suitably graded, may be covered with lime mortar or hydraulic cement, which may be laid over it about two inches in thickness, or it may have a superstructure of flooring of cheap boards laid over it, the pavement being afterwards laid upon such boards. I would remark, however, that in view of the great durability of this pavement (for the purpose of experiment I have had some of it in use for six years, on a road over which the travel has been very great) such flooring would seem to be unnecessary.

side by side, transversely of the roadway, alternately with strips of board, edgewise or vertical, in thickness about one-third of the principal blocks, placed transversely upon the foundation or support, and in this mode of construction so arranged as to form spaces of about one inch in thickness between the rows of principal blocks.

The auxiliary strip may be about half the height of the principal block, but it must not be permitted to fill up the grooves permanently and entirely when the pavement is completed, or to form any part of the surface of the pavement.

The earth of a roadway upon which my Improved Wooden Pavement of either plan is to be constructed must first be suitably graded in any of the usual and well-known methods, in order to prepare it for the reception of such pavement. When the street or roadway has thus been prepared for the reception of my pavement, I then cover the surface of the roadway or bed with tarred paper, or with hydraulic cement, laid over it about two (2) inches in thickness, or with a cheap flooring of boards or piank, which may also be covered with tar on one or both sides, by swabbing or by dipping the boards or plank; or any other preventive to moisture may be used in connection with said foundation or support —the object and effect of such foundation being the support afforded such pavement, and to prevent the absorption of moist-

ure from the ground by the wooden blocks. Said foundation is designated in said drawing by the letters *d d*.

I would remark, as to the durability of my pavement that, for the purpose of experiment, I have had some of it in use for six years before the month of March, eighteen hundred and fifty-four, on a road on which the travel has been very great.

Some of the advantages of my improved pavement are to be found in the hold that it offers to the feet of horses; in the little noise that is produced by carriages in passing over it.

Some of the advantages of my pavement are to be found in the hold that it offers for the feet of horses; in the little noise that it produces while carriages are passing over it, the absence of noise resulting from the peculiar character of the material of which the pavement is composed.

The absence of noise resulting from the peculiar character of the materials of which the pavement is composed.

This pavement is also very durable, its durability being occasioned by reason of the friction of the travel over it, being produced upon the slightly elastic extremities of the fibres of the wooden blocks.

This pavement is also very durable, its durability being occasioned by the friction of the travel over it being produced upon the slightly elastic extremities of the fibres of the wooden blocks, and by its solidity and durable material in the filling.

Moisture is excluded from the wood by the materials employed for the support of the blocks, also by the preventives, also by the tarry covering which is placed over the top surface as hereinbefore described.

Moisture is excluded from the wood by the materials employed for the support of the blocks; also by the preventives; also by the tarry covering which is placed over the top surface, as hereinbefore described.

My pavement has the advantage of great cleanliness in comparison with most other pavements ; because, in the first place, as there is very little wear of its upper surface, very little dust is likely to form upon it,

My pavement has the advantage of great cleanliness, in comparison with most other pavements; because, in the first place, as there is very little wear of its upper surface, very little dirt is likely to form upon it, and such

and such as does form upon it is quickly removed by rains and wind.

as does form is quickly removed therefrom by rains and winds.

There is a further advantage in respect to facility, cheapness, and accuracy in the process or method of forming the channels, grooves, or receptacles required for the desired filling in my improved construction, which results from two sets or series of parallel-sided blocks (or blocks and strips of board) employed as above mentioned.

By this method of forming such channels, grooves, or receptacles, the parallelism of the same, and of the principal blocks forming the ultimate surface of the pavement, and the uniformity in width or size and distance, one from another, of such channels, grooves, or receptacles, is effected in a cheap, simple, and expeditious manner, directly upon the prepared foundation resting upon the roadway, and any necessity of constructing the pavement in portable compartments is avoided.

What I claim as my invention is to so combine or arrange the blocks or wooden portion of the pavement that there may be cells or channels formed by such arrangement between them as described, and for the reception of tar and gravel or materials of like character; and that each cell or channel shall have a wooden bottom for the tar and gravel cement to rest on, where-

Having thus fully described the parts and combination of parts, and the operation of my Improved Wooden Pavement, and shown various modes in which the same may be constructed and made to operate, without changing the principle of its construction and operation, I claim as an improvement in the art of constructing pavements—

by when the mass of tar and stone in each cell is pressed down by the wheels of carriages, it shall be prevented from being forced through the cavity, and be caused to be spread in lateral directions so as to maintain a firm and close joint between the adjacent blocks, such as will operate to prevent water from passing down between their joints.

In testimony whereof I have hereunto set my signature this twenty-ninth day of March, A. D. 1854.

SAMUEL NICOLSON.

R. H. EDDY,
F. P. HALE, Jr.
Ex. R. W.

1. Placing a continuous foundation or support, as above described, directly upon the roadway; theu arranging thereon a series of blocks, having parallel sides, endwise in rows, so as to leave a continuous narrow groove or channel-way between each row, and then filling said grooves or channel-ways with broken stone, gravel, and tar, or other llke materials.

2. I claim the formation of a pavement by laying a foundation directly upon the roadway, substantially as described, and then employing two sets of blocks—one a principal set of blocks that shall form the wooden surface of the pavement when completed, and an auxiliary set of blocks or strips of board, which shall form no part of the surface of the pavement, but determine the width of the groove between the principal blocks, and also the filling of said groove, when so formed between the principal blocks, with broken stone, gravel, and tar, or other like material.

3. Placing a continuous foundation or support, as above described, directly upon the roadway, and then arranging thereon a series of blocks having parallel sides endwise in a checkered manner, so as to leave a series of checkered spaces or cavities between said blocks, and then filling said checkered cavities with broken stone, gravel, and tar, or other like material.

4. I claim the formation of a pavement by laying a foundation directly upon the roadway, substantially as above described,

and then employing two sets of blocks, viz., one a principal set of blocks, that shall form the wooden surface of the pavement, and an auxiliary set of blocks that shall form no part of the wooden surface of the pavement, but determine the dimensions of the tessellated cavities between the principal blocks, and then filling said tesselated cavities with broken stone, gravel, and tar, or other like material.

SAMUEL NICOLSON.

Witnesses:

STEPHEN A. GOODWIN,
DANIEL SHARP,
CHAS. F. THAYER.

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BRIEF FOR APPELLANTS.

SUPREME COURT OF THE UNITED STATES.

No. 203.

THE CITY OF ELIZABETH, GEORGE W. TUBBS, AND THE NEW JERSEY WOOD-PAVING COMPANY, APPELLANTS,

vs.

THE AMERICAN NICOLSON PAVEMENT COMPANY.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE DISTRICT OF NEW JERSEY.

Supreme Court of the United States.

THE CITY OF ELIZABETH *et al.*,
Appellants,

vs.

THE AMERICAN NICOLSON PAVEMENT CO.,
Appellee.

No. 203.

BRIEF FOR APPELLANTS.

This is a suit in equity, brought on reissued Letters Patent of Samuel Nicolson, dated August 20, 1867, No. 2,748, recited to be for a new and useful improved wooden pavement. The bill was filed April 27th, 1870. It sets forth the grant of original Letters Patent, dated August 8th, 1854; their surrender and reissue on December 1st, 1863, and the surrender of said reissue, and the grant of the reissue on which this suit is brought. It then sets forth the death of Nicolson January 6th, 1868; the appointment of George T. Bigelow as administrator, the extension of the patent from August 8th, 1868, and the assignment by Bigelow of the exclusive right under the patent for the State of New Jersey, excepting Jersey City. It then charges infringement, and prays relief in the usual form.

The answer, as amended, admits the grant of the original and reissued patents, and of the extension, and charges that the reissue sued upon is broader than the original patent. It denies infringement, and sets up that the wooden pavement laid by defendants is constructed according to the specification and claims of the patent granted to Brocklebank and Trainor, January 12th, 1869, and denies that their pavement infringes the complainants' reissue. It also alleges that the patent is void for want of novelty, and that the invention which it describes and claims is described in various English and French patents, which are duly set forth. It also charges that the invention of Nicolson had been in public and common use in the city of Boston for six years before the date of Nicolson's application, and that his patent was therefore void; and that such six years' use worked an abandonment of said invention to the public.

Soon after the bill was filed, a motion was made for preliminary injunction, which was heard by his Honor Mr. Justice Strong, who refused the injunction, but required the defendants to give bond in the sum of thirty thousand dollars. In delivering his opinion the Court said: "The patent of Brocklebank and Trainer of 1869 is the entire combination that makes up a wooden pavement. The patent is not for an improvement on a combination previously made. What is claimed is 'the combination of the bed (foundation), transverse strips and vertical blocks, when the latter are rebated, on one or both sides, and either with dovetailed rebates or otherwise, and the said strips fitted to the rebates and secured to the bed for the purpose of forming the wooden pavement.' Thus the patent is not for

an addition, but for an entire combination. We are now asked to decide that the patent is only for a colorable change of the combination patented to Nicolson, and to decide this at the beginning of the case. It may be that is so; but that it is, cannot be said to be clear. There is certainly a change of form of the constituents of the combination, if there is not a difference in the mode of arrangement. Doubtless, change of form of the constituents of a combination is often no substantial change. It may be only the substitution of an equivalent. The combination remains the same, though the form of the things combined greatly varies. But there are cases in which a change of form destroys the combination. They are those in which form is necessary to secure the beneficial result, and when, of course, a change of form of one or more of the things combined works a different result. There is considerable reason for the belief that Nicolson's combination demands blocks or strips of certain shapes or form, as essential to it, and that it contemplates blocks and strips having parallel sides throughout, without rebates in either. This was necessary to secure one of the avowed advantages of his invention—its cheapness of construction. Now it is very evident that the combination of the Brocklebank & Trainor patent works a different result in two important particulars from that obtained by the Nicolson combination. It distributes the pressure upon the surface of the pavement over a larger base, and it guards against a displacement of the strips or short blocks that separate the long blocks. This is effected by the defined forms of the constituents of the combination. The rebated long block and the strip or short block, so

so fashioned as to be fitted to the rebate, are, perhaps, something more than mere equivalents. It is true that the strip answers one of the purposes which the strip answers in the Nicolson pavement. It separates the long blocks, and thus forms a groove; but it is not necessarily for that reason substantially the same in the combination."

After the bond required had been filed, the parties proceeded to take testimony, and the cause came on to be heard before his Honor Judge Nixon. It was argued from January 31st, 1872, to February 15th. On the 11th of March an order for injunction was filed, and on the 26th of March a final decree for complainants was entered. No opinion of the Court was filed; but in November, 1873, defendants moved for rehearing, which petition was never heard. In the year Judge Nixon filed his opinion in the cause.

The Court held that none of the special matters set up, "except perhaps the Hosking patent, suggests the combination which Nicolson has made."

That the reissue is not void, as being broader than the original patent.

That the use of the pavement upon the Mill Dam at Boston, as proved, was experimental—was not a public use of the invention, "nor any such dedication or abandonment by the inventor as would avoid the patent afterwards issued by Nicolson."

And that the defendants had infringed the first and second claims, by laying the Brocklebank & Trainer Patent.

Record, pp. 193–199.

Errors.

We respectfully submit that the Court erred in holding:

First.—That the patent was valid as being for a novel invention.

Second.—That the caveat carried back the invention to its date, and protected Nicolson in his six years' user on the Mill Dam (p. 197).

Third.—That the user on the Mill Dam was not such a public use, with the consent or allowance of the patentee, for more than two years prior to his application, as to render his patent void.

Fourth.—That such user on the Mill Dam was not an abandonment or dedication to the public of the invention.

Fifth.—That the defendants infringed the first and second claims of the patent.

Sixth.—The Court erred in decreeing that the complainants do recover of the defendants, the City of Elizabeth and Geo. W. Tubbs, the sums set forth in the decree, because the Master did not find that said defendants had made any profits, which failure to find was not excepted to by complainants, and because no proof was offered by complainants of any profits whatever made by said defendants.

Seventh.—The Court erred in finding that the profits received by the defendants were the fruits of

the use of the devices described and claimed in the first and second claims of the Nicolson patent—there being no proof of any advantage derived by the defendants from such use of the Nicolson devices, or was incident to the use of the devices of the Brocklebank & Trainor patent. The failure to specifically show such profits makes the recovery nominal.

Eighth.—The Court erred in decreeing the whole amount of profits made by the New Jersey Wood Paving Company in the construction of the pavements referred to in the Master's report. Whereas, if any profits ought to have been decreed, they should have been confined to the amount of the license for a royalty which the complainants had been accustomed to receive, and was bound by the terms of their title to accept from any party constructing such pavement in New Jersey.

I.

The claims which defendants are held to infringe are as follows:

"1. Placing a continuous foundation or support, as above described, directly upon the roadway; then arranging thereon a series of blocks, having parallel sides endwise, in rows, so as to have a continuous narrow groove or channelway between each row, and then filling said grooves or channelways with broken stone, gravel and tar, or other like materials.

"2. I claim the formation of a pavement by laying a foundation directly upon the roadway, substan-

tially as described, and then employing two sets of blocks—one a principal set of blocks, that shall form the wooden surface of the pavement when completed, and an auxiliary set of blocks or strips of board, which shall form no part of the surface of the pavement, but determine the width of the groove between the principal blocks, and also the filling of said groove, when so formed between the principal blocks, with broken stone, gravel and tar, or other like material."

What are these claims for?

Mr. Renwick defines the first claim to be for the process of laying the pavement. "The second claim is to a mechanical structure. It claims the pavement with the strips in it after it is laid."

Record, p. 103, x-Q. 10.

The Court say as follows: "The complainant's patent, if valid, is doubtless for a combination. The several parts that make up the structure are: (1.) A continuous foundation directly upon the road-bed. (2.) A series of blocks, with parallel sides, standing endwise in rows, that form the wooden surface of the pavement. (3.) An auxiliary set of blocks or strips of board, which form no part of the surface, but determine the width of the grooves between the principal blocks. (4.) The filling of the grooves, when so formed, between the principal blocks, with broken stone, gravel and tar, or other like material."

Record, p. 194.

This language describes the pavement, and as the Court held us to infringe the first and second claims, it must have deemed the subject-matter of the first claim, as did Mr. Renwick, to be for the process of making this pavement.

A.

What is the claimed invention?

The elements of the combination of the second claim are:

1st—The foundation;
2d—The parallel-sided blocks;
3d—The strips;
4th—The filling.

1st. Looking at the specifications to see what the foundation must be, we find that it may be tarred paper, or hydraulic cement, or a cheap flooring of boards or cement. These boards may or may not be made insensible to moisture by covering them with tar on one or both sides, or any other preventative to moisture may be used.

Record, p. 9.

This foundation may then be either a permanently yielding one, which is non-absorbent of moisture, such as tarred paper. Such a foundation would not, of course, hold the blocks up, and when used, the resistance to downward pressure must come from the prepared earth beneath it.

Or a non-absorbent material which will remain soft during the laying of the pavement and will become hard afterwards, such as hydraulic cement.

Or a structure of boards, with or without tar or other prevention of moisture.

2d. Parallel-sided blocks. "The principal set of blocks is cut with parallel sides, lines or surfaces, from joists or timber about four inches square, or of

other suitable shape and dimensions, in cross-sections."

Record, p. 10.

3d. The strips: "The principal blocks are arranged side by side transversely of the roadway, alternately with strips of board edgewise or vertical, in thickness about one-third of the principal blocks, placed transversely upon the foundation or support, * * * so as to form spaces of about one inch in thickness between the rows of principal blocks."

Record, p. 10–11.

These strips must be parallel-sided. The specification says: "There is a further advantage in respect to facility, cheapness and accuracy, &c., * * * which results from *two sets or series of parallel-sided blocks* (or blocks and strips of board) employed as above mentioned." Record, p. 11.

And this is further obvious from the nature of the pavement. For, if blocks or strips not parallel-sided were placed against the parallel-sided principal blocks, the interstices which would result must be fatal to the pavement.

The first reissue describes both sets of blocks as parallel-sided: "In further carrying out my invention I make use of two sets or series of wooden blocks. They are cut with *parallel sides*."

Record, p. 176.

4th. The filling: It is to be "gravel, broken stone and tar," or "any suitable cementing material." Record, p. 10.

The essentials of the invention are:

Two series of blocks, each parallel-sided; some

kind of foundation, soft or hard, water-proof or not; and a filling of tar and gravel or other cementing material. When these are combined as described in the patent, they form a pavement having transverse grooves across the street.

B.

Wherein does the novelty of this pavement consist?

1. Not in the fact that it rests upon a foundation —firm, yielding, water-proof, or not water-proof. Foundations to support pavements are as old as the art.

Everybody knows that the Roman roads were laid in concrete.

Treadwell says:

Q. 5. Do you know what was the state of the art of preparing foundations for pavements prior to the caveat and original patent of Nicolson; and if so, what was it, referring, in your answer, to the English patents put in evidence in this case?

A. Aside from the common mode of preparing the roadway by grading and ramming, foundations for pavements were made, as early as the days of the old Roman roads, of concrete of broken stone and hydraulic cement, the pavement laid upon them being of stone.

For wooden pavements, I find foundations prepared as follows:

David Stead's English patent of 1838 states that in applying the wooden blocks as a paving, "the surface of the road or other such way is to be pre-

pared in as solid a condition as possible, and to the figure or intended slopes."

John Brown's English patent of 1838, for stone or wood pavement, states that the blocks are placed upon strips of angle iron, which rest on the previously prepared roadway, which is to be brought to the proper figure or slopes on the surface, and well beaten down, in order to consolidate the surface.

In Grimman's English patent of 1840, (on page 2,) he states, "I also propose to lay these blocks on a concrete foundation brought to a smooth or level surface either by a fine concrete or a thin layer of asphalt, or by laying thin slabs of wood on the concrete." He further says, (page 3), in substance, that he does not claim these modes of preparing foundations for wood pavement as his invention.

Parkin's English patent, of 1839 (at page 4), contains a statement as follows: "And according to my sixth mode, in paving, with blocks of wood of any figure, upon a foundation of sand, ashes, or saw-dust, saturated with tar or bituminous substance, especially if boiled, laid upon the natural ground for the blocks to rest on."

This pavement is further described as being formed of blocks with the grain vertical, and having channels or furrows between the blocks made by chamfering off the outer edges of the upper surfaces of the blocks, which furrows or chamferings may be made deep and filled up with asphalt or other cement, or gravel and sand, the object being in both cases to prevent the horses' feet from slipping.

In David Stead's English patent of 1839, he speaks of the foundation for the wooden blocks "being first suitably prepared to the required figure by the usual well-known means to receive such wooden

blocks," which I understand to include the concrete asphaltum and other foundations of prior date previously referred to in this answer. He describes a great variety of wooden paving blocks, some of them having channels between them filled with cement. He also describes a foundation of wood, composed of a layer of short or thin wooden pieces, upon which the blocks composing the surface of the pavement are placed.

In the English patent of Thomas Wood the younger, he does not describe any especial foundation as the foundation to which his pavement is to be applied, but states that the construction of his pavement is of such a character " as to prevent all displacement and give it a complete firmness and solidity, even when put down on a foundation of mere shingle, gravel or sand," by which I understand that this pavement was to be put upon any of the prior well-known foundations, and it might be put even upon mere shingle, gravel or sand.

A modification of this pavement, described on page 3, lines 22 to 26 inclusive, describes a pavement of long and short blocks, the long blocks being arranged in continuous rows across the street, a distance apart from each other, with channels between them formed by the short blocks, which formed the bottom of the channels, the channels being filled up with concrete or coal tar, asphalt, or other bituminous substance, heated and mixed with gravel, sand, or such like material.

In Pinkus' English patent of 1840, he describes, on page 2, a foundation for a wooden pavement similar to the old Roman foundations, being formed of a layer of close-set rubble stones, with their pointed ends up, the upper interstices between their

ends filled with chips of broken stone and grouted (which is a mode of applying cement in a fluid state to compact the mass). He also describes a foundation of bricks pointed with mortar or cement, at page 3.

In the English patent of Melano de Calcina, the wooden blocks are laid upon wooden sleepers, which are laid upon the road-bed and bolted together.

In the English patent to John Perring, 1842, at page 2, line 29, is the following statement: "When the blocks are to be laid on concrete or other artificial substratum, in a place where traffic is considerable, I make them six inches in depth." This patent describes blocks of wood laid in continuous rows, separated by intervening strips, so as to form continuous channels across the street, the blocks and strips being pinned together to afford mutual support.

The English patent of Reynolds, of 1842, contains the following: "In order to form a firm, compact, "and cheap paving, I first level the ground and ram "it hard, covering it also with sand if desirable. "Upon this I lay boards, planks, beams, laths, or "slips of wood, either in close contact or with any "intervals between them; and upon these boards, so "arranged, I place blocks of wood of any form.

"The forms of block which I prefer are parallelo-"pipedons or other figures such as may be formed "by one cut, either oblique or perpendicular to the "grain of the wood, from a plank of any breadth "and of any thickness, not exceeding four inches." Also the following additional matter relating to foundations:

"If desirable, I place a second, or even a third "layer of boards upon the first, embed them wholly

"or partially in cement, nail or otherwise fasten "them together."

The English patent to Moses Poole, 1842, describes (page 3, lines 19 to 30) a foundation prepared of oak laths, placed over each other cross-wise, and covered with a layer of gravel or earth well beaten down, and states that the expense of preparing this foundation will not be found so great as a foundation of concrete.

The English patent of Austin, 1843 (at page 2), contains the following statement: "To make my wooden pavement, with wood foundations for roads, I take any suitable number of planks, or slabs, or pieces of wood of convenient size or thickness for the foundation, and this foundation is to be glued, cemented, keyed, pinned, or otherwise fastened together in compartments."

Also, on same page, the following statements: "The compartments are to be strengthened by means of ledges, glued or otherwise secured across them underneath; and for the purpose of securing the whole paving together when wood is the foundation, the compartments should fit into each other or be glued, nailed, or screwed, or otherwise fastened on to separate pieces of timber laid underneath."

This is a description of a continuous wood foundation appropriate for protecting the paving blocks from moisture.

The English patent to Crannis and Kemp, of 1843, describes, as the first part of the invention (at page 2, commencing at line 10), "certain improved foundations for wood paving, which foundations are to consist also of wood, and are to be formed in manner following;" and then proceeds to describe various modes of constructing a continuous foundation of

boards, or boards and planks, locked and pinned together in various ways, to be applied to the roadway as a superstructure upon which the paving blocks of wood are to be laid. The paving blocks described are of various forms, among them long and short parallel-sided blocks, forming channels between them.

The English patent of Fontaine Moreau, of 1844, describes (at page 9) a foundation of asphalt for rows of blocks placed like a checker-board, and also a foundation of battens placed flat, one against the other, for the same pavement.

The English patent of John Hosking, of 1849, states (at page 2, line 26), that the foundation is made by levelling or curving the ground, or by a planking of wood or concrete, the surface of which is either a plane or curved. The superimposed pavement is made of long and short blocks of wood, rebated so as to support each other and leave continuous channels between, which are filled with hewn stone, or loose stone and cement, or with asphalt.

From the foregoing, it appears to have been a well-known state of the art, prior to the Nicolson caveat and patents, to apply wooden blocks to foundations prepared upon the road-bed of asphaltum, of asphalt concrete, of concrete of hydraulic cement, of concrete of broken stones and a grouting of mortar or other cement, of a concrete of tar and sand, saw-dust or gravel; and also to prepare foundations for wooden pavements of boards, loose or joined together in various ways, all of which served to support the paving blocks and to prevent moisture being absorbed by the paving blocks from the earth, the concrete and asphalt foundations being impervious to moisture, and the board or wood foun-

dations, although not completely impervious to water, serving to protect the blocks, to a great extent, from moisture, and to support them.

Q. 6. Do you consider that it required invention in 1847 to put any form of wood pavement upon any of the foundations described by you, and then known and in public use?

A. I do not, unless the form of pavement should be such as to require a connection with the foundation other than resting upon it. In such a case, the foundation would then form a part of the pavement. I mean, if the pavement, in some manner, penetrated into the foundation as well as rested upon it, in which case it would obviously be a part of the pavement. But to select arbitrarily some especial form of wood pavement, and lay it upon any of the well-known foundations for supporting the pavement, or for supporting and protecting is from moisture, would not, in my judgment, be an exercise of invention. It would be like building a building of different materials, or of different architectural ornamentation, upon a well-known foundation for buildings.

Examination adjourned to January 23d, 1871, at 11 A.M.

See Record, p. 126–129.

Mr. Renwick does not contradict this testimony.

In these patents you have every form of foundation described in Nicolson, except the tarred paper, which is specifically new for this purpose.

In all of them the foundation performs the same function with reference to the blocks placed upon it. It upholds them. It protects them against moisture —if it is waterproof; and it does each of these

things to each kind of block placed upon it, in precisely the same way.

In the state of the art thus exhibited, there was no invention in combining any kind of block with any kind of foundation, unless some new functions were preformed by the foundation.

The patent of Nicolson cannot therefore be sustained for a combination of his series of blocks with a foundation. If his superstructure be new, he may hold it; but there was no novelty in placing it on a foundation. Such a use of the foundation would be merely a double use.

2. The invention does not consist in using parallel-sided blocks of wood set with the grain of the wood vertically.

Stead, of 1838, describes sexagonal, triangular, or square blocks, with the grain vertical.

Record Exh., p. 54.

John Browne, of 1838, describes square blocks with the grain vertical.

Record Exh., p. 56.

Bennet, assignee of Perkins, of 1839, disclaims, for want of novelty, the right of paving with wood having the grain vertical, horizontal, or inclined.

Record Exh., p. 71.

Stead, of 1839, describes "a roadway formed of a series of parallopipedon shaped blocks placed with the fibre vertical, having a portion of the upper part of each side cut away, so as to form continuous longitudinal and transverse channels."

Record Exh., p. 77.

In the patent of *Pinkus* of 1840, the blocks are cubical, and are set with the grain vertically.

Record Exh., p. 82.

Perring, of 1842, describes blocks set vertically, and having parallel sides. They are, however, cut at an angle of forty-five degress, with thin surfaces.

Record Exh., p. 91.

Reynolds, of 1842, describes a pavement having parallel-sided blocks set vertically.

Record Exh., p. 95.

Harlow, 1842, has parallel-sided blocks set vertically.

Record Exh., pp. 101, 102.

Austin, 1843, has parallel-sided blocks set vertically.

Record Exh., p. 104.

Crannis & Kemp, 1843, shows parallel-sided blocks set vertically or at an angle.

Record Exh., pp. 109, 110.

Hediard, in a French patent of 1842, describes parallel-sided blocks set vertically.

Record Exh., p. 132.

It thus appears that the form of block and mode of setting described by Nicolson are both old.

3. The advantage of forming channels is described in the patent to consist in giving a hold to the horses' feet. (Record, p. 11.) Such devices are also old.

Channels or grooves are found in Parkin, of 1839; Stead, of 1839; Perring, of 1842; Reynolds, of 1842; Crannis & Kemp, of 1843; Fontaine Moreau, of 1844; Hosking, of 1849; Browne, of 1839; Grimman, of 1840; Wood, of 1840; Perkins, of 1840; Poole, of 1842.

Harlowe, of 1843; Austin, of 1843; Love, of 1846; and Hediard, of 1842.

It may be argued that the novelty in the Nicolson pavement consists in the specific fact that the grooves run across the street. But—

Austin has grooves across the street. "Upon which foundation I glue or cement the wooden blocks, of any convenient shape or size, without any fastening or connection together of the blocks, and with intervals or spaces between them to the entire depth of the blocks; these intervals or spaces are to be filled in with broken stone," &c.

P. 104, Suppl.

Parkin says that he cuts furrows or grooves *in any direction*, a few inches apart across the upper surfaces of the blocks of wood used in paving * *; but in case of small blocks being used, the grooves or furrows are formed by chamfering off the outer edges of the upper surfaces of the blocks, *which furrows and chamferings may be made deep*, and filled up with asphalt or other cement, or gravel, or sand.

Record Exh., p. 59.

Stead (1839) proposes "to place the blocks, or to have them of such form or forms * * * so that channels and cavities shall be left to afford a surer footing or hold for the feet of the animals traversing

over such inclinations." * * * "Fig. 21 and 22 is * * * another kind of roadway, formed of a series of parallelopipedon-shaped blocks, placed with the fibre vertical, and having a portion of the upper part of each side cut away, so as to form continuous longitudinal transverse channels, extending over the whole surface of roadway in lines parallel to each other. These channels may be left open, or so filled up with cement." (Rec. Exh., pp. 76, 77.)

Crannis & Kemp, p. 109: "The blocks are of parallelogramic form, and of two different sizes in point of height and thickness, and they are laid with the grain of the wood in a vertical position in rows, side by side, in such manner that the high and low blocks alternate in each row, and the high blocks in each row are opposite the low blocks in the adjoining row. * * * Figs. 22 and 24 represent the surfaces of various forms of blocks, any one of which may be used in wood paving * * * and made to afford a good foot-holding—either by surface grooving or cutting, or by causing rows of blocks of the particular form selected to alternate with shorter blocks of any convenient form." (Rec. Exh., pp. 109, 110.)

Austin, of 1843, describes "wooden blocks of any convenient shape and size, without any fastening or connection together of the blocks, and with intervals or spaces between them to the entire depth of the blocks. These intervals or spaces may be of the width of an inch and a half, or thereabouts, and are to be filled in with broken stone refuse, or broken slate, grit, gravel, * * * cemented or concreted together with liquid lime or cement poured in, or with pitch or lac, &c." (Rec. Exh., p. 104.)

Hediard, of 1842, describes grooves filled with concrete. (Rec. Exh., p. 132.)

Wood says: "The third modification *K* has the two-fold advantage of affording a secure foothold to horses, especially on an inclined plane, and of throwing the whole weight and pressure of the traffic on those blocks, which, having the larger surface upward, on being pressed or driven tend to consolidate the road. This is effected by making those series somewhat taller than the rest—say half an inch, more or less. I sometimes make those series considerably taller—say from one inch to three inches, more or less—and I fill in the spaces with concrete, &c., mixed with gravel, &c." (P. 80, Suppl.)

Mr. Renwick thinks that it is uncertain which way—transversely, or up and down the street—this pavement is to run, but the language, "throwing, the whole weight and pressure of the traffic on those blocks," makes this clear enough. If the grooves were longitudinal, the traffic would be on all the blocks, and no foothold would be gained for the horses. (P. 93.)

Pering has grooves across the street.

It has been suggested that the strips of Nicolson act as *spacers*, to determine the width of the grooves across the street. This is true. And so in all the pavements composed of blocks of an equal length do the short blocks determine the distance between the blocks which form the surface of the pavement. Such pavements are shown in *Cramis & Kemp*, pp. 107–110. Figures 41 and 42 show the exact arrangement of Nicolson, save that the intermediate blocks are longer than his. In *Perring's Patent*, the strips which are in the grooves are clearly spacers as much as are those of Nicolson. *Wood* clearly shows trans-

verse grooves in which the short blocks determine the distance between the long blocks, which form the surface of the pavement, by a row of short blocks.

It is respectfully submitted that, in view of the state of the art thus disclosed, the patent of Nicolson is void for want of novelty. Every element of the combination claimed is old.

It is old to put any form of blocks on any form of foundation.

It is old to put any form or direction of groove between any rows or series of any blocks, of whatever form.

It is old to fill these interstices with any form of filling.

The case of *Stimpson* v. *Woodman* is conclusive on this point.

Prior Use in Public.

The answer alleges that the inventions of Nicolson were in continuous public use, with his consent and allowance, for six years prior to his application. And that this public use amounted to an abandonment by said Nicolson. (P. 53.)

It appears by the proofs that Nicolson filed a caveat on the 2d of August, 1847, which described the form of pavement described in the patent and claimed in the third and fourth claims of the reissue, to wit: the checker-board pavement. In the summer of 1848 Nicolson was Treasurer or Superintendent of the Boston and Roxbury Mill Corpora-

tion; "he used to have the whole charge of the road" (p. 81, x-Q. 12), and caused a pavement to be laid on a toll-road maintained by this corporation under the authority of its charter.

The complainants claim that this pavement was the same as that described in the first and second claims of the reissue. If this be true, then the invention of Nicolson is proved to have been of a date earlier than the patent of Hosking, which it is contended by us so limits the scope of the Nicolson patent that we cannot be held to infringe it. Our position regarding this Mill Dam pavement is this: If it was the pavement of the patent, then it has been abandoned to the public. If it was not the pavement of the patent, and we are held as infringers, then it is anticipated by Hosking.

What was this pavement? The witnesses who testify to it are Nutting and Lang, who saw it laid; Fairbrother, who saw it four or five times during the week occupied in laying it; and West, Bigelow and Stanwood, who saw it after it was down.

Nutting testifies that there were three forms of pavement laid on this road—one a tesselated pavement, with a filling of pebbles and tar; another of rows of blocks with boards between them, the grooves being likewise filled with pebbles and tar; and a third of round blocks, with the interstices similarly filled. These pavements were set with the round logs in the gutters, the chequered form next, and the groove form on the crown of the road. (Pp. 72, 73, Q. 8.)

He says the foundation was sand and tar on the road-bed to the depth of from one to three inches (Q. 9.) He was at the toll-house when this pavement

was being laid, on a visit to his brother, the day tollman. (Q. 3, Q. 6.)

Lang describes the same pavement, but is in doubt about the foundation. He says: "Some foundation was laid. I think it was board." If boards were put down they were covered with tar; if other material, it was mixed with tar. (P. 78, end of Ans. 7. P. 80, 81, x-Q. 1 to 8. P. 82, Q. 5.) The result of his examination is that he can only remember distinctly that tar was used.

West and Bigelow have no distinct memory.

Fairbrother describes the pavement in the same manner as the other witnesses. Regarding the foundation, he thinks some of it was laid on a foundation, and some on sand and tar. In his answer to the 19th cross-interrogatory, he says: "x-Q. Were there any boards under any of the blocks? A. It strikes me there were some under some of the paving. Ans. 20 x-Q. I think it was under square blocks."

Stanwood remembers two different forms of blocks, but cannot place them. He testifies to repairs, and "found there was an original foundation. I can't now say whether this foundation was made of wood or tar cement." (Ans. 8, p. 69.) But he also testifies that when repairs were made the bottom of the roadway was dug out. (Same ans.)

We respectfully submit that from this testimony the Court can go no further than to find that *some* foundation was used under some part of this pavement.

The inventor himself throws no light on this question. He says in his original patent, granted in 1854:

"The earth upon which the pavement is to rest

may be prepared by covering its surface with tarred paper or other preventive to moisture." And he also suggests "lime, mortar, or cheap boards." And he adds, very significantly, "In view of the great durability of this pavement, such flooring would seem to be unnecessary." (P. 174, 175.)

In other words, tarred paper, hydraulic cement or boards may be used. And as he does not direct the boards to be protected from moisture, the foundation may be water-tight or not at pleasure. In other words, he describes substantially the devices constituting the state of the art of foundations for pavements, and says that any of them may be used with his.

It is claimed that this testimony carries back Nicolson's invention to 1848, and that the use on the Mill Dam was only an experiment, and therefore does not amount to abandonment or abdication.

To give the patent all the chance we can, we must look at the evidence which is to give this use an experimental character.

Stanwood, being asked about Nicolson's visits to this pavement, and about conversation in regard to the object or intent for which such pavement was laid, said: "* * I heard from him in conversation that the object in laying it was to try the experiment, that being a place on which there was a great deal of travel. He often expressed himself as being perfectly satisfied with the experiment." "One great object, I understood from Mr. Nicolson, was to see what effect heavy teams would have on the pavement in starting; and also to see if it would not be easier for teams to start on this pavement than on the common roadway." * * * (Pp. 69, 70.)

These conversations occurred with Mr. Nicolson not before August, 1854. (P. 68, Q. 3.)

And the patent was granted August, 1854. Mr. Nicolson may by that time have seen the weak place in his patent.

Nutting—"From June, 1849, Mr. Nicolson visited this pavement almost every day when it was fair weather, and would examine it, and ask how people liked the new pavement, &c." Mr. Nicolson was treasurer and superintendent of the company, and would make others go to the toll-house every day. "He stated it was for the purpose of testing the pavement. * * * If it would stand there it would stand anywhere," &c.; "said he laid it at his own cost and expense" (pp. 73–74).

Lang—"Mr. Nicolson was there almost daily, and when he came he would examine the pavement; he would often walk over it, cane in hand, striking it with his cane, and making particular examination of its condition; * * * He asked me very often how people liked it; * * he took a great deal of interest in it" (p. 77, Q. 8–10).

He claimed in 1849 that it was a success, and then conversations occurred during say three years (p. 81, x–Q. 13; R. D. 3).

West—"He used to look at it, walked over it, and examined it closely, and spoke to me about it. * * * He put it down as an experiment, thinking he should make a good thing out of it."

"Int. 7. State whether at these times he stated his object in placing the pavement there, and what, if anything, he stated in regard to getting a patent for the invention if it should prove successful. (Objected to as leading.)

"Ans. I don't remember whether he said anything

at that time about a patent; it is so long ago that I don't recollect. I have no doubt that in subsequent conversations, he told me he was going to get a patent, but I can't fix the time. He said he had put it there as an experiment, and he hoped to make a good thing out of it." And then on cross-examination he said he thought Nicolson had said something to him about the pavement before 1854, but could not swear positively (p. 86–87, x-Q. 1–2).

So two of these witnesses show him talking about the pavement as experimental shortly before, and (Stanly) just after the patent. It is easy to see that this talk was to avert the consequences of his previous abandonment.

And this is all that there is to convert this public user of six years into an experiment.

Nothing was done to change the pavement in any way from the moment it was laid down. So far as appears, Nicolson made no other than that examination which his duty of taking charge of the roadway required, and the invention was as perfect when the pavement was laid as it was when he applied for his patent.

In 1847 Nicolson filed a caveat describing his tesselated pavement (p. 114).

The effect given by the Court to the laying and use of this pavement is set forth by the learned Judge as follows:

"It is impossible to read the testimony in reference to laying the section of the pavement upon the dam, and the conduit and declarations of Nicolson respecting it, without reaching the conclusion that he was making an honest experiment, and that the caveat was filed for his protection while he was engaged in it. * * * * The question of diligence

is not absolute, but a relative one, and must be considered with reference to the subject-matter of the experiment.

"In all calculations as to cost, which necessarily involved the fact of durability, long use and lapse of time were essential ingredients. In the absence of all intent, and indeed in the face of a manifest contrary intent, I am not willing to infer from the facts in the case that there was any such public use of the invention, or any such dedication or abandonment by the inventor, as would avoid the patent afterwards issued to Nicolson." (P. 197.)

We respectfully submit that this is entirely without justification from the evidence.

First, as to the caveat. A caveat has no significance beyond that given to it by the statute. It confers the right upon the caveator to receive notice of the filing of any application for a patent interfering with it, *for the period of one year only* (Act of 1836, § 12). It does not and cannot have any other effect whatever.

Now, it appears by the testimony of *Fairbrother* (Rec., p. 87, Qu. 3), that this pavement was laid in the summer of 1848 while the caveat was filed August 8, 1847. (Rec., p. 114.) So the pavement was not laid till the caveat either had expired, or was about to do so. In view of this fact, it is not easy to understand upon what ground the learned Court held that "caveat was filed for his protection" during the experiment. (Rec., p. 197.)

In fact, the caveat has no other place in this case than to show that in 1847 Nicolson had completed his chequer-board invention—from which he never advanced at all, if the complainants are right in

saying that the chequer-board pavement and the transverse groove pavement are the same.

The circumstances of the user were these: Nicolson laid the pavement. The *locus* was on a public toll-road, of which he was superintendent.

We claim that this was a user in public—by the public—for the profit of Nicolson, his company, and in part of their performance of a public duty. This user made it impossible for him to obtain a valid patent, because the pavement had been in public use for more than two years prior to his application.

The corporation was created by the statute of Massachusetts in 1814. Among its franchises was the right to make a dam, "and to connect the different parts thereof by bridges and causeways so as to render the same a good and substantial road, suitable for the passing of men, loaded teams, carts and carriages of all kinds, railed and furnished with lamps, and to receive toll for passing over the same." The franchises of this corporation have been considered and defined by the Supreme Judicial Court of Massachusetts.

Boston Water Power Co. v. *Boston & Worcester R. R.*, 23d Pick., 360.

Commonwealth v. *Hancock Free Bridge*, 2 Gray, 58.

They include "the right and duty of making a good substantial road from Boston to Brookline, to receive tolls, to keep the road in repair, under liability for damages in case of defect, * * * and also to indictment, and also to the power of the County Commissioners to open the toll-gates in case the road should be out of repair. The tolls were

fixed by statute. A penalty of fifty dollars to be enacted against all persons who sought to pass without paying toll."

Mr. Dexter's Deposition, pp. 158–159, Q. 6–11.

We contend that the use of this pavement upon their road was a use by the public for profit to the corporation.

The pavement was laid in performance of a public duty, the violation of which was punishable by indictment.

Any person who chose to pay toll had a right to use their pavement.

The profit from its use was insured by public enactments, which punished by fine all who used it without paying for it.

Once laid, this pavement ceased to be controlled by Nicolson, and became part of the system of public roads, subject to the supervision and direction of the public authorities.

And its maintenance in good order was part of the performance by the corporation of the condition upon which it held its franchise.

Certainly the public used this pavement and paid for using it, and all men might use it by paying for its use.

What constitutes its use an experiment? In 1849 he said he laid the pavement as an experiment, and claimed that it was a succes. In 1854, about the time he got his patent, he said the same thing.

And this is all.

There is not one word of evidence that he ever changed the pavement in any way, examined it in any way except superficially, or in any respect conducted any tests to learn the detail of its operation.

This is not an experiment. It is at best an attempt to ascertain its commercial value, not an endeavor to perfect his invention.

No case can be found where such laches have been excused on the ground of experiment.

By the sixth section of the Act of 1836, under which this patent was granted, it is provided that any person may apply for and obtain Letters Patent for any improvement, &c., not known or used by others before his discovery or invention, and not at the time of his application for a patent in public use or on sale with his consent or allowance. Section seven provides that if it shall not appear to the Commissioners that * * * it had been in public use or on sale with the applicant's consent prior to the application, he may grant an application for a patent. Section seven of the Act of 1839, provides that no patent shall be held to be invalid by reason of any prior use by and with the consent of the inventor for two years prior to the application.

We have here to deal with the Act of 1836, for the public use of Nicolson's pavement lasted six years before his application.

The language of this Act is substantially that of the Statute of 21 Jas., Ch. 3, which authorizes the grant of patents for "new manufactures * to the * first inventors of such manufactures, which others, at the time of making such Letters Patent, shall not use." The language of our Act has been held to be substantially that of the Statute of James.

Pennock v. *Dialogue*, 2 Pet. 1.

"In public use" means, in our law, a use in public.

Rich v. *Lippincott*, 2 Fish. 1.

"C."

"The statute (Act of 1839, Sec. 7) is inflexible as to the time when the patent is to be applied for, with reference to the prior use and sale of the invention. The neglect to apply within two years after such sale or use is invariably fatal. Whenever this fact appears the patent falls. Whatever the circumstances, the courts have no dispensing power."

Blandry *v.* Griffith, 3 Fish., 609, 617. (Swayne, *J.*, dictum.) (1869.)

Cleveland *v.* Towle, 3 Fish., 525, 526. (Giles, *J.*, charge.) (1869.)

Goodyear *v.* Hills, 3 Fish., 134, 138. (Cartter, *C. J.*, dictum.) (1866.)

Hussey *v.* Bradley, 2 Fish., 362, 375. (Hall, *J.*, implication.) (1863.)

"I could not resist the conclusion that the use of the machines by the complainants, with the consent of the patentee, for a period of more than two years before the application for a patent, in the absence of any evidence that a single step was taken to secure one, or that either the inventor or the complainants ever intended to secure one, had destroyed the right of the patentee to a patent for his invention. It would be difficult, on the present evidence, to hold that the use was not a public use. And if it was a public use, then the patentee, by permitting such use for more than two years before he made any application for a patent, forfeited all right to one, and his patent is void." (1861.)

Tappan *v.* Natl. Bk. Note Co., 2 Fish., 195, 197. (Shipman, *J.*, opinion.) 4 Blatchf., 509, 510, 511.

The use of several machines in public for more than two years prior to applying for a patent, although slightly varying in form and arrangement, yet substantially the same as afterwards patented, cannot be alleged to be experimental, so as to avoid the legal consequences of such prior use. (Patent held invalid.) (1861.)

Saunders *v.* Logan, 2 Fisher, 167, 172, 174. (Grier, *J.*, decision.) 3 Wall., Jr.

Rich *v.* Lippincott, 2 Fish., 1–8. (Grier, *J.*, charge to jury.) (1853.)

Bell *v.* Daniels, 1 Fish., 372, 378. (Leavitt, *J.*, charge.) (1858.)

Ransom *v.* Mayor of N. Y., 1 Fish., 252, 273. (Hall, *J.*, charge.) (1856.)

Adams *v.* Edwards, 1 Fish., 1–12. (Woodbury, *J.*, charge.) (1848.)

Adams *v.* Jones, 1 Fish., 527, 530. (Grier, *J.*, comment on statute.) (1859.)

Bartholomew *v.* Sawyer, 1 Fish., 516, 520. (Ingersoll, *J.*, comment on stat.) (1859.)

Kendall *v.* Winsor, 21 How., 322. (Curtis, *J.*, charge, implication, 327.) (1858.)

Sickles *v.* Mitchell, 3 Blachf., 548, 549. (Ingersoll, *J.*, comment.) (1857.)

Sargent *v.* Seagrave, 2 Curtis, 553, 555 (Curtis, *J.*, dictum.) (1855.)

"The patentee may forfeit his right to the invention if he constructs it and vends it to others to use, or if he uses it publicly himself in the ordinary way of a public use of a machine, at any time prior to the period of two years before he makes his application for a patent. That is, he is not allowed to get.

any benefit from the sale or the use of his machine without forfeiting his right, except within two years prior to the time he makes his application" (p. 235).

"It is proper to say, however, that this ground of forfeiture (dictum—there was also abandonment) is not favored in law, but is regarded as being somewhat harsh in its operation on individual rights.

"The evidence therefore should be quite clear that the use was not by way of experiment, or for the purpose of perfecting the machine, in order to justify the conclusion that the patentee had forfeited his right to the improvement."

Pitts *v.* Hall, 2 Blatchf., 229, 235, 237. (Nelson *J.*, charge.) (1851.)

McCormick *v.* Seymour, 2 Blatchf., 240, 254. (Nelson, *J.*, charge.) (1851.)

Heinrich *v.* Luther, 6 McLean, 345–347. (McLean, *J.*, charge to jury, statement of law.) (1855.)

Allen *v.* Blunt, 2 Woodb. & Min., 121, 143. (Woodbury, *J.*, dictum, statement of law.) (1846.)

Hovey *v.* Henry, 3 West. Law Jour., 153, 155. (———, charge.) (1845.)

Pierson *v.* Eagle Screw Co., 3 Story, 402, 407. (Story, *J.*, charge to jury, statement of law.) (1844.)

Singer *v.* Bramsdorf, 7 Blatchf., 521, 532, 533. (Blatchford, *J.*, decision, statement of law.) (1870.)

Act of 1793, Sec. 1. Use prior to application for patent.

"Upon most deliberate consideration, we are all of opinion that the true construction of the act is, that the first inventor cannot acquire a good title to a patent if he suffer the thing invented to go into public use, or to be publicly sold for use, before he makes application for a patent. His voluntary act or acquiescence in the public sale and use is an abandonment of his right, or rather creates a disability to comply with the terms and conditions on which alone the Secretary of State is authorized to grant him a patent."

Pennock *v.* Dialogue, 2 Pet., 1, 23, 24. (Story, *J.*, decision.) (1829.) 4 Wash., 538, 544. (Washington, *J.*, decision.) (1825.)

Thompson *v.* Haight, 1 U. S. Law Jour., 575. (Van Ness, *J.*) Law Dig., 603. (1822.)

Whitney *v.* Emmett, Bald., 303, 309, 310. (Baldwin, *J.*, charge.) (1831.)

"A strict construction of the act, as it regards the public use of an invention before it is patented, is not only required by its letter and spirit, but also by sound policy. A term of fourteen years was deemed sufficient for the enjoyment of an exclusive right of an invention by an inventor; but if he may delay an application for his patent at pleasure, although his invention be carried into public use, he may extend the period beyond what the law intended to give him."

Shaw *v.* Cooper, 7 Pet., 292, 321, 322. (McLean, *J.*, decision.) (1833.)

Ryan *v.* Goodwin, 3 Sumn., 514, 518, 519. (Story, *J.*, charge to jury.) (1839.)
Wyeth *v.* Stone, 1 Story, 273, 281. (Story, *J.*, dictum.) (1840.)
Reed *v.* Cutter, 1 Story, 590, 597. (Story, *J.*, comment on statute.) (1841.)

"The defendants used the invention of Harley for four months before his application for a patent; this use was public, and not only with his express consent and allowance, but he himself made the rollers on the plan he invented during those months from the time when he had ascertained the utility of his invention. It would therefore be no strained, if not the fair construction of this act, if under such and the other circumstances in evidence in the cause, the court had charged the jury that if they believed the witnesses, the patent subsequently obtained was void."

McClung *v.* Kingsland, 1 How., 202, 208. (Baldwin, *J.*, dictum.) (1843.)
Stimpson *v.* West Chester R. R., 4 How., 380, 403. (McLean, *J.*, cont. of stat.) (1845.)

"Now it is undoubtedly true, as the law stood at the time of this patent, in October, 1834, that the public use of the invention with the consent of the patentee, or sale of it, prior to the time of his application for a patent, operated as a forfeiture, as a dedication to the public. This, however, means the use of the perfected invention—the invention complete. If the use be experimental, to ascertain the value of, or the utility, or the success of the thing invented, by putting it into practice by trial, such use will not deprive the patentee of his right

to the product of his genius." (Nelson, *J.*, charge to jury.)

Winans *v.* New York & Hart. R. R., 31 Jour. Frank. Inst. (3d ser.), 316, 322' (1855.)

Winans *v.* Sch. & Troy R. R., 2 Blatchf.. 279, 300. (Nelson, *J.*)

Such is the settled construction of the Statute of James.

Carpenter v. *Smith*, 1 Webs. P. C., 543.

Household Iron Co. v. *Neilson*, 1 Webs. P. C., 543.

Cornish v. *Klem*, 1 Webs. P. C., 568.

Shad v. *Williams*, 2 Webs. P. C., 126.

The English and American cases both distinguish between an experimental and a public use. And it is well settled that a merely experimental use is not a public use which renders a patent void. And there are cases where the experiment must be public from the very nature of the invention.

Such cases are the *Locomotive Engine Co.* v. *Pennsylvania R. R.*, 6 *Gazette*, p. 927–931, where about three years elapsed from the building of the first engine with the improved truck to the date of the application. But there frequent changes were made in the engine.

In re Newell & Elliot Patent, where the invention consisted in an improved apparatus for laying a submarine telegraph cable, the inventor used it in fulfilling a contract, and immediately applied for his patent.

4 C. B. (N. S.), 295.

In these and the similar cases of *Seymour* v. *Mc-*

Cormick and Winans v. *The Schenectady R. R.*, the nature of the invention required the experiments to be protracted and to be in public. But no case can be found where the inventor used his invention *without change* for the period of six years, and then obtained a valid patent.

In *Pitts* v *Hall*, 2 Blatch., it was proved that the patentee completed and used his machine for four years prior to his application; but it was also proved "that the use was by way of trial, and that the ex-"periment resulted in a change in the machine," and the Court held that this, if proved, was experimental and not public use.

In *Birdsell* v. *McDonald*, 6 Gazette, 682, where a use was proved of more than two years prior to the date of the application, which delay was solely due to the neglect of the solicitor employed, it was shown that the user was "tentative," and resulted in changes in the machine.

In *Henry* v. *Francestown Stove Co.*, 9 Gaz., 408, one sale was proved more than two years before the application; but this sale was with notice of intention to apply for a patent, and it was shown that after this sale the patentee continued to improve his invention, and the stove was delivered on trial.

Such is the rule in England.

Adamson's Patent, 6 D. M. G., 420.
Bramah v. *Hardcastle*, 1 Web. P. C., 44, n.

Now, in this case, the user was in public—by the public—as part of the performance of a public duty, and for hire.

The only evidence regarding this user is that of

two witnesses, who heard Nicolson say, in 1849, that the pavement was laid as an experiment.

This only proves that it was *laid* as such; not that it was *used* for six years as such.

Nutting swears that in 1854, about the time he applied for a patent, he said he laid the pavement as an experiment.

In *Sisson* v. *Gilbert*, 9 Bl., 185, the patentee made and sold stoves for the period of seven years before his application. He swore, at the trial, that he wsa all the time at work improving his invention, and that he only perfected it within two years of his application. But this defence was overruled.

The same state of facts was found in *Hide and Leather Splitting Co.* v. *Tool Co.*, 1 Holmes, 503, and it was held that the patent was void.

The true view of this case is this: The invention was in use in public for six years. During all these years the inventor was idle and did nothing. It is immaterial what was his intent in laying his pavement. By its very use it passed from his control into the public domain. "Whatever be the intention of the inventor, if he suffers his invention to go into public use through any means whatsoever, without an immediate assertion of his right, he is not entitled to a patent; nor will a patent obtained under such circumstances protect his right."

Shaw v. *Cooper*, 7 Pet., 323.

Infringement.

Does the Brocklebank & Trainor pavement infringe the Nicolson reissue? This depends upon the construction to be given to that reissue. And

to ascertain that we must look first at the reissue itself, and, secondly, at the original patent.

The first claim is for placing a continuous foundation or support in the roadway, then arranging thereon a series of blocks *having parallel sides* endwise in rows, so as to leave a continuous channel-way between each row, and filling the grooves with the described material.

Mr. Renwick defines this claim to be for a process of laying a pavement.

If it be valid at all, it must be because the pavement itself is novel—since the laying the foundation, placing thereon the blocks, and filling the insterstics, are the same in all pavements. The stress of the suit is in the second claim.

Of this claim the learned Court said: "The complainants' patent, if valid, is doubtless for a combination. The several parts which make up the structure are—(1.) A continuous foundation directly upon the roadway. (2.) A series of blocks, with parallel sides, standing endwise in rows, that form the wooden surface of the pavement. (3.) An auxiliary set of blocks, or strips of board, which form no part of the surface, but determine the width of the grooves between the principal blocks. (4.) The fitting, &c."

Turning to the patent for a description of these elements, we find the foundation to be any one of the foundations known to the state of the art.

Two sets of blocks are used. One of these forms the wooden surface of the pavement, while the other determines the size of the grooves between the principal blocks.

The *principal* set of blocks is cut with parallel

sides. They are cut in cross-sections from timber, four inches square.

The "auxiliary" blocks must also be parallel sided:

(1.) They are so described: "There is a further advantage * * * which results from *two sets* of parallel-sided blocks (or blocks and strips of board) employed as described above."

Patent, p. 11.

(2.) It is obvious that if the sides of the "principal blocks" are parallel, the sides of the auxiliary blocks must be also parallel. Otherwise they would not properly perform their functions of fitting the bottom of the grooves, and upholding the other blocks. They are so shown in the drawing.

(3) They are so described in the original patent: "I make use of two sets or series of wooden blocks. They are cut from joist or timber, four inches square, or of other similar dimension, in cross sections, the larger blocks being about eight inches in length, while the shorter are formed about half the length of the others."

P. 173.

(4.) They are so described in the first reissue: "I make use of two sets or series of wooden blocks. They are cut with parallel sides."

P. 176.

(5.) In the pavement, with transverse grooves across the street, it is said that boards may be used instead of the short blocks. But the patent treats

this as only a variation in form from the first described pavements.

(6.) And boards are parallel-sided.

In his opinion on the motion for injunction, Mr. Justice Strong said: "There is considerable reason for the belief that Nicolson's combination demands blocks or strips of certain shapes or form as essential to it, and that it contemplates blocks and strips having parallel sides throughout, without rebates in either. This was necessary to secure one of the avowed advantages of his invention—its cheapness of construction" (p. 48).

The defendant laid the Brocklebank & Trainor pavement. That pavement consists of the well-known foundation of tarred boards. On these boards are placed an upper layer of transverse planking—beveled on each edge, one inch in thickness, an inch and three-quarter inches wide at the top, and beveled down so as to give one and one-fourth inches at the bottom. On this pavement are ash blocks, rebated at the lower end so that the beveled transverse planks may fit into them. The blocks are so set as to form a groove across the roadway. This groove is filled with the usual filling. This pavement is laid in the usual way. First the tarred boards are laid down; then a row of blocks is placed upon them; then the beveled plank is fitted into the rebate at the bottom of these blocks; then the next row of blocks is laid, and so on.

It will readily be seen that this pavement is radically different from that of Nicolson.

(1.) The blocks are not parallel-sided.

It is urged that the blocks of our pavement are *substantially* parallel. They are, of course, parallel from the top of the transverse planking to the surface of the pavement. But the form of this part of the block is perfectly immaterial either to the strength, durability or mode of laying the pavement. The part of the block which bears the strain is the lower part. In Nicolson's, the stress bears against the side of the block, and gives it all the capacity it has against the forward thrust of the travel over it. It is thus the part of the block in which the form of the sides of the block is essential.

(2.) It is hardly necessary to argue that the rebated block and beveled transverse planking produce a substantially different result from the paralleled blocks and strips of Nicolson.

The learned Judge below was of this opinion. He says: "They (Brocklebank & Trainor) added a new feature to the Nicolson combination. They rebated the blocks, on one or both sides, in a dove tail or vertical form, and beveled the strips to suit the rebates; which addition, it is claimed, made a mechanically different structure, and was an improvement in that it guarded against the displacement of the strips, or short blocks, and distributed the pressure upon the pavement over a larger surface. We are inclined to think that there is a good foundation for this claim of the defendants, whether we look for it in the evidence of the case or in the well-ascertained principles of mechanics."

So also, Mr. Justice Strong, in his opinion, said:

"Now it is very evident that the combination of the Brocklebank & Trainor patent works a

different result in two important particulars from that obtained from the Nicolson combination. It distributes the pressure upon the surface of this pavement over a larger base, and it guards against a displacement of the strips or short blocks that separate the long blocks. This is effected by the defined forms of the constituents of the combination. The rebated long block and the strip or short block, so fashioned as to be fitted to the rebate, are, perhaps, something more than mere equivalents. It is true that this strip answers one of the purposes which the strip answers in the Nicolson pavement. It separates the long blocks and thus forms a groove, but it is not necessarily for that reason, substantially the same in the combination."

* * * * * * *

"The parts of Brockelband and Trainor's improvement are different in form from those of Nicolson's, their arrangement is different, and so is their connection with each other. It is not, therefore clear, that in using the improvement the defendants are injuring any rights of the complainants.

The evidence on this point is very full. The great defect of the Nicolson pavement and the reason why it has proved a failure, grew out of the fact that the blocks and strips were parallel sided. A mere inspection of our pavement will show that the distribution of the strain is radically different from that which takes place in the Nicolson structure. In this the blocks are upheld against vertical thrust by the board or tarred paper foundation, and *nothing else*. Against forward thrust they depend upon the strip and the filling. If the filling comes out or the

strip gets loose and works up, the pavement is gone. In the Brocklebank and Trainor pavement, on the other hand, the vertical push is received on the edge of the transverse planking as well as upon the foundation. It is transmitted through the transverse plank to the next block, and so throughout the whole pavement. By the medium of the rebate in the block and the beveled boards the whole pavement is knit together like the stones in an arch. The so-called strip cannot work up, and if the filling comes out the pavement still stands. It is in evidence that in constructing this pavement, heavy carts of gravel and cauldrons of pitch were sustained by the structure before the filling was put in, without the least injnry.

"In laying the pavement, the men who laid the blocks would frequently be at long distances in advance of those whose business it was to fill the interstices in the pavement with gravel, and previous to said filling loaded teams were in the habit of passing over the pavement, also of hauling our gravel pans and tar kettles, loaded over the blocks before the filling was in, without any injury to the pavement.

"I remember, on one occasion, of some three or four hundred feet of the pavement being laid, and no gravel being on hand, the public used said pavement for several days before gravel could be procured, without injury to the pavement."

Tubbs, p. 154.

WILLIAM T. B. MILLIKEN says (Supreme Court Record, p. 223):

I am a lawyer. I was one of the original parties who introduced the Nicolson wood pavement in New

York City, and in New York State. * * * During the time I was in the business, this pavement was laid in Albany, Troy, Utica, and also in New York. In New York we laid pavements for private parties only, except in Nassau Street, from Pine to Wall. The Mercer Street pavement was laid about the time I left the company. * * *

I am very familiar with the first pieces which were laid in the city of New York, and that which was laid in Albany. Outside of these cities I am not very familiar. During the time I was operating the American Nicolson Company, I had frequent occasion to examine pavement in New York. My knowledge of pavements prior to this time had been entirely theoretical, and, with reference to the wooden pavement, my attention was particularly drawn in regard to its resistance of two classes of wear—one the surface wear, and the other the stability of the foundation. In regard to the surface wear, I was not disappointed; in regard to the foundation, I concluded that the Nicolson pavement was quite defective from two sources. One was that the boards in the foundation, as laid, were not stiff enough to prevent their bending and adapting themselves to the irregularities of the surface and the different diversities of the ground, thereby producing unevenness of the surface; the other, which I consider the fatal defect of the pavement, was the use of the strip, from the fact that the movement of the foundation board drove the strip to the surface, and drove out the concrete between the blocks. The first piece we laid in Nassau Street was taken up within, I think, two months, from that defect, and a portion relaid. We then attempted to remedy that defect by nailing the strip. We nailed through the lower front edge of the strip, the lower front corner of the block, and into the foundation board, the nail being driven obliquely. The defect in that seemed to be almost as great as without the nail. The strip, I mean, seemed to work up almost as soon, and the scientific difficulty in the thing was that you could not hold two sides of the strip at once; that the strip became attached to the row of blocks behind it, and not to the

row which was in front of it. From my observation, any pavement that had a board foundation is better without the strip than with it.

WILLIAM BERRIAN GREENE says: (Sup. Ct. R., 225.)

The Nicolson pavement laid by me is now in ruts and holes. Mercer Street wos, at one time, almost impassable, and has been repaved. Nassau Street was very bad. The strips had all worked up; had forced the gravel up, and I have seen the water spurt up high—ten feet high. This I locate in Mercer Street, at the junction with Waverly Place; it was about as bad as bad as it could be. On Pearl Street, at the corner of Liberty, and also at the corner of Maiden Lane, the strip had not only worked itself up, but had worked the blocks up, so that they were within one or two inches of coming out altogether. This was after the pavement had been laid about a month or six weeks. On Liberty Street, Murray Street, and on the first four streets I named, the strips worked up. * * *

THEODORE REEVES says: (Sup. Ct. R. 225.)

I was employed as an inspector of pavements from 1867 to 1870. * * * I inspected the laying of the wooden pavement in Mercer Street, part of Great Jones Street, Hall Place and Irving Place. Those were all Nicolson pavements. The result was, they were stopped on Irving Place from laying down the strip, for the reason it was not according to contract, and the result of the strip not being according to contract was they were obliged to change it.

The result of my inspection is bad in reference to this pavement. On Mercer Street the strip worked up, I presume, by rusting of the nails. The consequence was, that the gravel, getting under, threw the strip up, let the water in, and thus destroyed the pavement.

PHILIP H. TRAVER says: (Sup. Ct. R. 228.)

I reside at No. 111 Bank Street, and my business is that of foreman in laying wooden pavements. * * * The condition of the Nicolson pavement, when I repaired it, was bad, caused, in my judgment, by the strip working up to the surface of the pavement, forcing out the concrete, allowing the water to go in and destroying the pavement. * * *

The cause of the strip becoming loose is, in my opinion, the constant jar and tremble of the pavement under use, which causes the nails to rack or break off; the nails are put through the lower edge of the strip, taking in the corner of the block, and driven into the flooring; only one side of the block is thus nailed. The nails were not broken in all cases where we repaired. Sometimes they would draw out; the nails would be perpendicular of the strip. The cause of the decay was, in my judgment, the water getting in under the strip.

JAMES M. TITUS says (Sup. Ct. R., 231):

The constant motion of the wheels rolling from one block to the other broke the nails and held the strips, and let them work up, and this spoiled the pavement.

This witness testified that the Ingersoll pavement had been subseituted in Mew York for the Nicolson, by order of the Commissioner of Public Works.

MICHAEL DOYLE says (Sup. Ct. R., 233):

The strips were worked upon the street and the blocks loose. The strips, I mean, put in between the block had come up to the top of the pavement, and were cut to pieces by the wheels; the blocks were consequently loose.

GRENLEAF STACKPOLE says (Sup. Ct. R., 233):

I am a mechanical engineer, solicitor of patents, and expert in patent cases. I am familiar with the mode in which it is laid. I have frequently noticed

the pavement which I saw when being laid, and its condition. I pass over it nearly every day. The most of the Liberty Street pavement which I have examined, I have noticed that the strips have worked up to the surface of the blocks, and in some cases are entirely out and the blocks loose. I have also seen that it has been frequently repaired; I recollect it was repaired between Washington and Greenwich Streets the year after it was laid. The effect of the strips working out in that pavement, is to leave the blocks loose, and allow the water to get under the blocks, which floats the blocks and washes out the concrete and gravel between them. The cause of the strps working out, in my opinion, is that they are nailed to only one row of blocks; the rows cannot, consequently, be fastened together. In laying that pavement, they nail the strip to one row of blocks, and then set up another row of blocks, and nail to them another strip; thus the rows of blocks are not fastened together, and the jar breaks off the nails, and gradually causes the strips to work up.

D. L. De Golyer says: * * * (Sup. Ct. R. 270.)

Q. You have stated that the De Golyer was substituted for the Nicolson, in 1867; why was it substituted?

A. Because the city judged that it was far superior to the Nicolson, in consequence of the strip of the Nicolson working up, and that the pavement was much more firm and solid without the strip.

Q. Was your attention called to the use of the strip or short block, in laying the Nicolson pavement; if yea, what was your observation thereupon?

A. Yes, sir; it was that the strip had a tendency to work up and throw out the gravel and tar that was in the channel-way above the strip, the result of which was the loosening of the blocks, and rendering the pavement liable for water to go down into it, and finally destroy the pavement; this allowed or caused a displacement of the blocks; in making repairs to, or relaying the Nicolson pavement, the

De Golyer patent was used, the strip being left out.

Q. State, if you know, the difference in the expense of laying the Nicolson and De Golyer No. 1 pavements?

A. It is about ten (10) cents a yard in favor of the De Golyer; the latter can be laid that much cheaper than the Nicolson, and is so much more durable than the Nicolson.

JAMES K. THOMPSON says: (Sup. Ct. R. 271.)

I am 56 years of age; reside in Chicago, Illinois, and my occupation is Commissioner Board of Public Works in Chicago.

Q. How long have you been Commissioner of Board of Public Works?

A. Since February, 1872.

Q. What was your occupation previous to that?

A. I was Superintendent of Streets and Bridges since 1861.

* * * * * *

Q. Was the use of Nicolson pavement superseded by the use of any other wood block pavement; if yea, what?

A. It was; by what is known as the De Golyer No. 1, and the Stowe foundation pavement. I don't think there has been any Nicolson pavement laid since 1867 or 1868. I don't recollect of a yard of it, except by repairing it.

* * * * * *

Q. What constitutes the difference between the De Golyer No. 1 and the Nicolson?

A. The row of blocks are kept apart by a strip in the Nicolson, and in the De Golyer there is no strip used.

Q. Which, in your judgment, is the best pavement?

A. The De Golyer No. 1; from the fact that in the De Golyer No. 1 the whole space is filled with gravel, while in the Nicolson the space is but half filled with gravel, the strip occupying the other portion of the space, which has tendency of working up from the floor, forcing the gravel out of the space.

WILLIAM H. CARTER says, Sup. Ct. R., 272:

I am fifty-one years of age; reside in Chicago, Illinois, and am a member of the Board of Public Works in Chicago.

Q. How long have you resided in Chicago, and how long have you been a member of the Board of Public Works?

A. I have lived in the city since 1854, and have been a member of the Board of Public Works since February, 1868.

* * * * * * *

Q. State, if you know, about how long the city continued to lay that pavement?

A. My impression is, until about the year 1867; about which time the use of the Nicolson pavement was abandoned.

Q. What pavement was substituted and generally used in place of the Nicolson?

A. What is generally called De Golyer No. 1.

Q. What constitutes the difference between the Nicolson and the De Golyer No. 1?

A. The Nicolson uses the strip and the De Golyer is without it. The Nicolson, in the space between the blocks, is part gravel and part strips; the De Golyer gravel only.

* * * * * * *

Q. If your attention has been called to the working or use of the strip in the Nicolson pavement, what has been your observation thereupon?

A. The flooring of the street being laid crowning, the strip laying crosswise of it being straight, loaded teams passing over this strip caused it to spring, and the consequence was, it caused the gravel to work up, and the blocks to work loose. A further objection to the strips was, that we found that where wood came in contact with wood, as it does in the Nicolson, it rots much quicker than when the wood came in contact with gravel and tar.

JOHN MCARTHUR says (Sup. Ct. R., 273):

* * * * * * *

Q. State, if you know, about what time the city commenced laying the Nicolson pavement?

A. I think about 1856

Q. How long did the city continue to lay the Nicolson pavement?

A. Till 1866; that was the last that was laid.

Q. What pavement, if any, was afterwards used in paving the streets of Chicago?

A. It was what is salled the De Golyer of No. 1, De Golyer No. 2, and the Stowe Foundation pavements. The greater part was the De Golyer No. 1.

Q. Please describe the substantial difference between the pavements mentioned in the last answer?

A. The Nicolson pavement has a strip, between the block, three inches by one inch, the space above the strips, and between the blocks, being filled with gravel and tar. The bottom boards were tarred on both sides before being laid down, and the blocks immersed in hot tar before being laid. The De Golyer No. 1, as it is called, omitted the strips or pickets between the blocks, the whole space being filled with gravel and composition, and the flooring being laid without being tarred. The Stowe foundation pavement is laid without any flooring or bottom boards, and with a tapering wedge one inch thick and six inches wide, driven down between the blocks about half way, the space above the wedge being filled with gravel and composition, as in the others. The De Golyer No. 2 is the same as No. 1, except that there is no tar used with the gravel, and the blocks are preserved by a chemical process to prevent rotting (Sup. Ct. R., 274).

* * * * * *

Q. State, if you know, why the De Golyer pavement was substituted for the Nicolson?

A. It was found, on examining the Nicolson pavement, that the strips or pickets became loose and worked out, and the whole pavement became loose. (Sup. Ct. R., 274.)

* * * * * *

EXHIBIT A—S. S. WILLARD (Rec. 274).

* * * * * *

Previous to this a small amount of pavement, somewhat different from that termed the Nicolson pavement, had been laid. This pavement omitted the particular features on which it was understood that

the patent was claimed as an original invention; that is, the insertion of a strip or picket between the rows of blocks and the tarring of the floor boards on which the pavement rests. The favorable experience had with it, and a careful comparison of its merits with the so-called Nicolson patent, led to its adoption by the Board. Its principal difference consists in this: The Nicolson pavement half occupies the space between the rows of blocks with a three-inch strip or picket, on the top of which is filled three inches of composition of gravel and tar. The pavement in use by the Board has the whole of the space packed with a composition of gravel and tar. It is found that in much of the pavement heretofore laid, the picket works up to the surface, forcing out the gravel and leaving the blocks without support and loose. So far as the experience of the Board goes, nothing of the kind occurs with the composition filling rammed in between the blocks, and they are found as firmly set now as when first laid. The new pavement is apparently a firmer and more lasting one than that termed the Nicolson.

The decree below should be reversed.

Respectfully submitted,

A. Q. KEASBEY,
CHARLES F. BLAKE,
Of Counsel with Appellants.

New York, April, 1878.

United States Supreme Court.

THE CITY OF ELIZABETH, GEORGE W. TUBBS AND THE NEW JERSEY WOOD PAVING COMPANY,

AND

THE AMERICAN NICOLSON PAVEMENT COMPANY.

ON APPEAL

From U. S. Circuit Court for the Dist. of New Jersey.

Argument of A. Q. Keasbey,

Of Counsel with Appellants.

HOLBROOK'S Steam Printery, No. 11 Mechanic St., Newark, N. J

In the United States Supreme Court.

THE CITY OF ELIZABETH, GEORGE W. TUBBS AND THE NEW JERSEY WOOD PAVING COMPANY, *Appellants*,
AND
THE AMERICAN NICOLSON PAVEMENT COMPANY, *Respondents*.

The Bill in this case was filed in the Circuit Court for the District of New Jersey, on the twenty-ninth of April, eighteen hundred and seventy, and before the passage of the act of Congress of July 8th, 1870, and the case is to be governed by the law as it stood at the filing of the bill.

The case has one striking peculiarity which will be found of great importance in this discussion.

It is a Bill in Equity for the infringement of a patent against the user of the article alleged to be covered by the patent and the manufacturer of that article jointly; and the manufactured article is a public highway in a city, being a wooden pavement.

The bill after alleging the patent and its re-issue, and the exclusive license of the complainant to use the invention in the State of New Jersey except Jersey City, and certain adjudications respecting the patent, alleges the infringement in the following terms:

"That since the first day of April, 1870, (being only nineteen days prior to the filing of the bill), and at divers times and occasions between that time and the filing of this bill, the defendants herein at the City of Elizabeth, without any legal assignment, grant or license, and in violation of the complainant's patent rights, have made, constructed and used a wooden pavement, and pave-

ments substantially like and upon the plan and principle and in imitation of and embracing the invention and improvements contained in the re-issued Letters Patent, or substantial and material parts thereof, and that the defendants persist in so doing and refuse to desist, though warned and requested so to do, whereby great injury has resulted to the complainant, and great gain and profits of a large sum of money have accrued to the said defendants from the use of the complainant's exclusive rights."

And it prays:

"That the said defendants may be compelled to account for and pay over such gains and profits which have accrued or arisen to them, by reason of the invasion of the invention of the said patent rights and of the avails of the sale of the exclusive rights foresaid, and for the profits and avails which the complainants would have derived from the sale and use of such invention, but for the unlawful acts of the defendants."

The bill makes no distinction as to the positions occupied by the several defendants, and does not treat George W. Tubbs, who was the president of The New Jersey Wood Paving Company, or that Company itself as the manufacturers of the wooden pavement, nor the City of Elizabeth, as the purchaser or user of that pavement, nor does it attempt to distinguish between any profits gained by the manufacturer in the making of the article, from any alleged profits obtained by the city from its use—nor does it assert that the City of Elizabeth contracted with the paving Company for the construction of the pavement.

It is alleged however that the infringement complained of took place in the City of Elizabeth.

The defendants answered, jointly denying the validity of the patent and of the re-issue, insisting that Samuel Nicolson was not the original and first inventor of the pavement described.

That the re-issued Letters Patent were void as covering and including many things not invented by Nicolson, or claimed under his original patent.

That the patent is void for want of novelty, and that the alleged invention was in public use with the knowledge and consent of Nicolson long prior to his application, and that such use worked an abandonment and dedication to the public.

The Court in its preliminary decree sustained the validity of the patent, and held that the defendants have infringed and violated the said patent by making, using and vending *in the City of Elizabeth*, a wooden pavement containing the improvements described in the said Letters Patent, and recited in the first and second claims thereof, and that the defendants do account to the complainant for damages for the use and profits in consequence of the said infringements, and that an account of damages or use and profits be taken, and stated by a Master of the Court.

And that a perpetual injunction be issued restraining the defendants from making, using or vending any wooden pavement containing or embodying any of the inventions or improvements described in the original Letters Patent, and recited in the claims thereof, and that the plaintiff recover of the said defendants the damages or use and profits which shall be reported by the Master.

There is still nothing in the decree or in the opinion of the Court to indicate the different positions occupied by the manufacturer of the pavement, and the City, which simply contracted with such manufacturer for its purchase and the use of the same as a public highway. The directions of the Court are all addressed to the defendants generally, and declare that they have violated the patent, in making, using and vending wooden pavements *in the City of Elizabeth*, and that the defendants jointly shall account for the damages, or use and profits in consequence of such infringement.

The testimony taken before the Master discloses the fact that the New Jersey Wood Paving Company was the sole manufacturer of the pavement in question; that they made the pavement under various contracts with the City of Elizabeth, in its corporate capacity, and with other parties, for the general price of $4.50 per yard, and that the contract price was fully paid by the city to the Wooden Paving Company.

The Master in his Report, made on the twenty-ninth of October, 1873, recites the Decree of the Court that the defendants' account to the complainant for the damage or use and profits *in consequence of* certain infringements of the complainant's patent, and then goes on to say, "it being conceded by the complainant's counsel that the bill in this case having been filed prior to the act permitting damages to be assessed by a Master in such pro-

ceedings as the present, no damages could be assessed, I have made no assessment of damages, but restricted my consideration to the account of profits made by the defendant *in the infringements* specified in the decree."

It will be observed that the infringement specified in the decree was the making and using of certain pavements *in the City of Elizabeth*. But not regarding the decree in that respect, the Master goes on to report that the defendant, The New Jersey Wood Paving Company, laid in all 72,042 $\frac{8}{10}$ yards of wooden pavement, called the Brockelbank and Trainor pavement, and decreed to be an infringement upon the complainant's patent, distributed as follows:

Laid in the City of Plainfield under a contract between the said city and George W. Tubbs or the New Jersey Wood Paving Company,	square yds.	2,700
Laid in the City of Elizabeth under contract between the said city and George W. Tubbs or the New Jersey Wood Paving Company, as follows:		
Grove and Garden Streets,	sq. yds.	10,148 $\frac{4}{10}$
Newark Avenue,	"	30,827 $\frac{3}{10}$
Sherman Avenue,	"	4,958 $\frac{1}{10}$
North Avenue,	"	14,957
Grier Avenue,	"	3,449
Laid on Sherman Avenue beyond the City of Elizabeth on contract with land owners and paid for in land,	sqr. yds.	5,000
In all,	sqr. yds.	72,042 $\frac{8}{10}$

That the defendant The New Jersey Wooden Paving Company received therefor as follows:

From the City of Elizabeth upon said contracts, being the exact amount of the contract price, -	$310,198 29
From the parties interested in the paving of Sherman Avenue beyond the city limits, being the contract price, - - - - - - - - - -	22,513 50
The contract price of the pavement in Plainfield, of which a part appears to be uncollected and uncollectable, - - - - - - - - - -	14,223 04
In all, - -	$346,934 83

And goes on to state that the gross profits of the said defend*ant*, (not defend*ants*, but evidently referring to the Wood Paving Company), upon all of the said work after deducting the cost, and assuming that the whole contract price of the Plainfield pavement could be collected, and that the lands given for the Sherman Avenue extension were worth the contract price, as admitted by the said *defendant* (evidently still referring to the Paving Company), and appearing by their books of account, to be $123,610 78
It then goes on to allow certain deductions amounting to 48,775 38

And states a balance of net profits of $74,835 40
Interest is added to the amount of - - - - 16,588 51

Making profits and interest - - - $91,423 91

Thus it appears that a though the decree was against the defendants joint y and genera ly for certain infringements in making, using and vending pavements *in the City of Elizabeth*, the Master, assuming to confine himse'f to the gains or profits made by the defendants in the infringements specified in the decree, immediate y proceeds to report the actua' receipts and expenditure of one of the defendants a'one, the New Jersey Wood Paving Company, in constructing the pavements not only in the City of E izabeth, but in the City of Plainfield, ten miles away, and in an adjoining township entire y beyond the city imits, and reported the gains and profits to be the tota' actua' net receipts above expenditures and deductions obtained by the New Jersey Wood Paving Company in their various contracts for laying pavements with the City of Elizabeth, and other corporate bodies or private individuals.

And it charges the City of Elizabeth as an infringer of the patent, with the profits made by the Paving Company, on contracts with which the City had nothing whatever to do.

No attempt was made in the proof before the Master or in the Master's report, to discriminate in any possible way between the profits received by the City of Elizabeth, and those received by the New Jersey Wood Paving Company, and in fact, the report shows clearly, that no regard whatever was had to any inquiry, except as to the amount of gains made by the Paving Company in

their various contracts for laying the Brockelbank and Trainor pavement in Elizabeth and elsewhere .

No distinction whatever is made between the position occupied by the city and the Paving Company, except that in stating the gross profits of the Paving Company, and in speaking of the admission of such profits, he uses the word "defendant" in the singular number, obviously referring to the Paving Company alone.

In other parts of the report he does not even observe this precaution, but uses the word defendants, in the plural in such relation, as to the construction of the pavement, as to show that it evidently referred only to the manufacturing company and not to the city, for which, in its corporate capacity, the work was done under contract.

Upon the coming in of this report numerous exceptions were made, and a petition for a rehearing was presented and refused.

Upon the hearing of the exceptions the Court confirmed the Master's report, October 2, 1874, after striking out the allowance of interest and another small item, and decreed that the complainant do recover of the said defendants the sum of seventy-four thousand nine hundred and ninety-two dollars cents, found by the Court *as the damages, or use and profits*, which the plaintiff is entitled to recover by reason of the premises, with costs.

Throughout this decree and the final opinion of the Court, there is still nothing to indicate that any distinction was made between the user and the manufacturer of the patented article, nor is there anything to explain why it was that the Court found the City of Elizabeth, the user of the article, liable for this large amount of profit which the maker of the article by means of its contract with the city, and with other parties, had gained upon said entire work of laying wooden pavements in that city, and also in another city and township.

In fact, the opinion begins by stating that the defendants were held to have infringed the Letters Patent of the complainant by making, using and vending "in the City of Elizabeth" wooden pavements containing the improvements embraced and described

in the first and second claims, and that thereupon the Master had reported that the defendant, the Wood Paving Company, had made 72,042$\frac{8}{10}$ yards of the Brockelbank & Trainor pavement in Plainfield, Elizabeth, and Sherman avenue, outside of the city limits, and that in making such pavements it had received such contract prices from the various parties for whom they were made, as resulted in the profits specified.

There is no intimation of any proof of profit made by the City of Elizabeth, or if any profits were made by any of the parties using the pavements out of which the profits arose to the manufacturer, what part of these profits were made by the City of Elizabeth, and what part by the City of Plainfield, and the parties interested in Sherman Avenue outside of the City.

Nor is there anything in the Master's report or in the opinion and final decree, to show that the defendant, George W. Tubbs, individually received any profits whatever, or was in any way concerned in the infringement, except as President of the New Jersey Paving Company.

In fact, the whole evidence shows that the Paving Company was the manufacturer of all the pavements in all the places where they were laid; that George W. Tubbs had no individual connection with any of them, and that the City of Elizabeth had no connection whatever with the manufacturers in making a large part of the pavements reported by the Master, nor with those laid in the City of Elizabeth, except that of purchaser from the manufacturer at a definite price which was duly paid.

The whole opinion and the decree treated all the defendants jointly, including the City of Elizabeth and George W. Tubbs individually, and holds them all liable for the whole profits received by the said defendant, the Manufacturing Company as the result of the entire work done by that Company.

It should also be observed that on the 30th November, 1870 the defendants filed a petition for re-hearing (Case, 199), in which they urge that they were not advised by any opinion of the Court, wherein these alleged infringements consisted, or what construction was given to the claims of the Letters Patent, so that it was im-

possible for them to prepare a true and exact account of the gains and profits which were due to the inventor, as ordered by the Court; that there was a conflict before the Master as to the principle on which he ought to proceed as to estimating the gains and profits, and especially that the defendant the City of Elizabeth was greatly embarrassed by reason of the uncertainty as to what the Letters Patent covered, and in what the infringement consisted, and that it found it impossible to learn what the Court deemed the Letters Patent to cover, or in what particular the pavement laid by the said City and necessarily used by the public, were considered to infringe.

This petition was answered by the complainant (Case, p. 201), in which answer it was stated among other things that no request had been made upon the city to abstain from using the pavements, and that it had not been the intention of the complainant to make any such claim, because it was advised that the recovery of the profit as provided for in said decree would equitably at least amount to a continuing license to the city to use the said pavements until they were worn out.

Under the circumstances thus set forth we insist that even assuming for the sake of argument the patent to be valid, and the defences urged by the defendants to be of no force, the final decree of the Court is erroneous and ought to be reversed.

I. It is erroneous as to George W. Tubbs individually.

The Master reported that all the pavements were laid by the New Jersey Wood Paving Company, and the Court so declared in its decree, and although some of the contracts were made with Tubbs individually, and some with the Paving Company, yet it appears that the Paving Company were in fact the manufacturers and received the sole profits, and there is no attempt to show that the profits or any part of them were received by Mr. Tubbs in his private capacity.

II. It is erroneous as to the City of Elizabeth.

The only relation that that corporation had with the transaction was as a purchaser of a part of the pavements for a definite contract price, which was paid in full.

The pavements so made for the city within its corporate limits

are used by the city, and if they infringe the complainant's patent the city was liable for such infringement in the proper form of action, but it was not liable in equity in common with the manufacturer, for all the profits made by the manufacturer, not only for the articles made for and used by the city, but also for other articles made for other parties, and never by any possibility to be used by the City of Elizabeth.

At the time when this bill was filed the infringement had scarcely begun; as to many of the pavements even the contracts had not been made. The bill alleges that the infringement began on the 1st April, 1870, a few days before the bill was filed.

At that time, as the law then stood, the complainants had their election of remedies.

In the language of this Court, in Birdsall v. Cooledge, 3 Otto 64:

"Two remedies were open. He might proceed in equity and recover the gains and profits the infringer had made by the unlawful use, the infringer being regarded as the trustee of the owner in respect of such gains and profits.

"Or he might sue at law and recover as his own damages compensation for the pecuniary injury suffered, without regard to whether defendant had gained or lost by the unlawful acts."

In Williams vs. Leonard, 5 Fish. 381, Woodruff J. says:

"Before July 8, 1870, suits in equity could not be brought to recover both damages and profits. A decree for both is wrong. The complainant had his election to proceed for such gains and profits, or to sue for damages, and he chose the former. As to the result of such election, the law has not been changed since he brought his suit, and it is no hardship that he is held to his election."

And in Cowing v. Rumsey, 8 Blatch. 36, Woodruff J. says:

"A patentee whose rights are infringed has his election of remedies. He may proceed in equity for the profits the defendant has made, or he may sue at law for the loss he has suffered.

"In the first case if the defendant has realized no profit there

can be no recovery. In the second he may recover the damages he has sustained whether the defendant has made any profit or not."

On these familiar principles the complainant, so far as the City of Elizabeth was concerned, had its choice of remedies. That Corporation was obviously the mere user of the infringing article. In fact the article was not then made and could not then be used. It was in process of manufacture for subsequent use, and with regard to a large part of the manufacture out of which the profits arose subsequently, the infringement was only in contemplation and was not an actual fact.

But the complainant has a right to treat the city and the manufacturer as joint tortfeasors and to bring an action at law to recover the damages suffered up to the time when the action was begun. If such action had been brought and the patent sustained, both city and manufacturer would have been held liable for such damages as might have been recovered, upon the well settled principles concerning damages for infringements in actions at law, and they would have been both liable jointly and severally for such damages, but they must have been confined to the injury as it stood at the time of bringing the action.

Or the plaintiff might have filed a Bill in Equity against the infringing manufacturer for injunction and for an account of profits, which in that case would cover the entire profits made by the manufacturer up to the time of the Master's report, although the work had been done during the progress of the suit, if not restrained by injunction.

But the plaintiff did not choose either of these remedies. He preferred to file a bill in equity for damages against both the user and the maker of the article. Their object was evidently a preliminary injunction which should stop the whole work, and an ultimate account of the profits made by the manufacturer in the progress of the work

In the first object they did not succeed—the Court refused the preliminary injunction asked for, upon a bond filed by the defendants in the sum of $30,000, to secure the amount of probable ultimate profits.

This suit in equity would probably lie against the maker and user jointly, on the ground that the complainant sought a discovery and an injunction, but this form of proceeding obviously involved the result that no damages could be obtained against either party, because the law did not then permit damages to be given in suits in equity; and it involved the necessity of abandoning any claim against the City for profits, simply because it was impossible for the City to make profits out of the transaction. The manufacturer alone could make profits, and it is plain from the report of the Master and the decree of the Court, that it was the profits made by the manufacturer only, that could have been the subject matter of the decree.

It is true that in the case of some patented articles, a profit might be made both by the manufacturer and the purchaser, as in the case of the Swedge block patent and the Tanner brake, and other similar machines, where there might be a manufacturer's profit on the construction of the machine, and a profit by the railroad company or other purchaser in the use of it, but these would not be the same profits, not would they be derived from the same source. The one would be the mere manufacturer's profit in the construction, while the other would be the user's profits in saving expense in connection with other machinery, or in the application of the patented article to practical purposes.

But in this case the article made was a pavement—a highway. The profits made, were distinctly those which the manufacturer of that pavement made in its construction, and the entire profits so made came out of the contract price paid by the user.

No proof whatever was attempted to be made that the city derived any profits, and it would have been a difficult task indeed to prove that that city or any other city made a profit by buying wooden pavements at $4.50 per yard, constructed over miles of streets cut through its suburban fields. Such an attempt would have revealed the fact that so far from its being a profit to the city it was really its ruin.

This decree could only be for profits actually made. None of the difficulties which have arisen since the act of July, 1870, as to

the distinction between damages and profits in equity have any application to this case. It was conceded before the Master that only the profits actually made could be recovered, and that the whole profits in fact made were made by the Wood Paving Company, and not by the city. Yet the result is a decree, not only against the Wood Paving Company who really received the profits, but against the City of Elizabeth and George W. Tubbs, for the large amount of nearly seventy-five thousand dollars, which embraced profits derived by the Company, not only for the work contracted for by said city, but also for work done in another city and an adjoining township.

We insist therefore that as to the City of Elizabeth and George W. Tubbs this decree must be wholly reversed and set aside.

III. The decree is erroneous as to the defendant The New Jersey Paving Company, not only in respect to the validity of the patent, but also in respect to the amount of the profits decreed. This argument will be confined to the latter point, the former having been fully discussed in opening the case.

The simple principle upon which the Master has framed his Report, and the Court its decree, was to ascertain the actual cost of all the pavements laid by the Company in the various localities, and to take this amount from the prices received from the cities and individuals purchasing, and to state the balance as the net profits for which the defendants are liable. The result is one of those excessive decrees which have brought reproach upon the administration of the law in respect of the difficult subject of profits in patent cases.

It is, of course, difficult to frame a theory or to establish a principle, which will secure parties wholly against this injustice. But one principle is definitely settled which may prevent injustice in this case. That principle is that where a definite royalty is fixed and where the parties claiming profits have been in the habit of disposing of their patents for a definite license fee, the price that they have been in the habit of receiving, must be taken as the measure of the profits which the infringer is deemed to hold in trust for the patentee.

In fact, in Senate Bill No. 300, which has lately been so fully discussed by the best experts in patent law and practice throughout the country, the principle that any license fee fixed is to be the invariable measure of the patentee's compensation, and if no such fee is fixed the Court shall fix and determine what ought to be a reasonable license fee, and measure the compensation accordingly, has been adopted by the Committee and made to apply to all cases where it is possible to apply it.

It provides that where by the election of the patentee, or signified by his usual course of dealing, the patentee's gain comes from use by others, the rules of damages at law shall apply and no account of profits shall be allowed. (See printed arguments before Com on Patents Nov. 15, 1877.)

This may soon become the law and open a new field of discussion and new problems for solution. It is a subject which in the nature of the case can never be free from obscurity and difficulty.

In the case of Packet Co. v. Sickels, 19 Wall. 210: This Court has indicated its dissatisfaction with the results which are so often reached in the endeavor to carry out the theory that the defendant in a patent case is a trustee for so much as he has made by the use of the plaintiff's property for the use of the plaintiff.

The Court says, "The rule in suits in equity of ascertaining by reference to a Master the profits which the defendant has made by the use of the plaintiff's invention stands on a different principle. It is that of convert ng t e infringer into a trustee for the patentee as regards the profits thus made; and the adjustment of these profits is subject to all the equitable considerations which are necessary to do complete justice between the parties, many of which would be inappropriate in a trial by jury. With these corrective powers in the hands of the Chancellor the rule of assuming profits as the groundwork for estimating the compensation due from the infringer to the patentee has produced results calculated to suggest distrust of its universal application, even in Courts of Equity; certainly any unnecessary relaxation of the rule we have laid down in cases at law where the patentee has been in the habit of selling his invention or license to use it, so that a fair deduction can be made as to the value which he and those using it have established for it, does not commend itself to our judgment nor is it encouraged by our experience."

In Burdell vs. Denig, 2 Otto, 710, it is held:

"Profits are not the primary or true criterion of damages, for infringement in an action at law applies eminently and mainly to cases in equity, and based on the idea that the infringer shall be converted into a trustee as to those profits for the owner of the patent.

"Sales of licenses of machines, or a royalty established, constitute the primary and true criterion in an action at law.

"No doubt in the absence of satisfactory evidence of either class in the forum to which it is most appropriate, the others may be resorted to as one of the elements on which the damages or the compensation may be estimated."

In Eunson vs. Simms, 6 Fish, 281, which was a bill for damages and profits against the user of a machine in good faith, Judge Nixon explains the change in the law which occurred in 1870, and holds that in such case the license fee accustomed to be charged, is the measure of plaintiff's compensation, and that a decree for damages to that extent gives the defendant the right to use the machine for the life of the patent.

The defendants are not proceeded against as tortfeasors, but an account against them is sought in equity on the ground that they are trustees.

A Court of Equity does not punish; it only restores and makes amends; it seeks to put the plaintiff where it would have been if the infringers had sought a license; it holds that the defendant is a trustee,—in this case an innocent one, for the money which the plaintiff would have received but for the invasion of his rights incautiously committed, and in such cases if the Cour can ascertain by what measure the plaintiff has himself estimated the rights which he claims to have lost, it will hold the defendan only liable for that sum.

In Penn. vs. Jack., 5 Law Rep. Eq., 81, Sir William Page Wood says:

"If the plaintiff's case had been one of a patentee who had never granted a license, and had always remained his own manufacturer, the question would have been one of great difficulty, and

I do not hesitate to say I would not have attempted to grapple with it, but I should have sent it to a jury to settle the amount of damages"

In Saunders vs. Logan, 2 Fisher, 167, Judge Grier says:

"The complainant alleges in his bill that he is the original and first inventor and patentee of a machine for winnowing, &c. The Bill prays for an injunction and an account; and yet admitting the validity of the patent and its infringements by the respondents, it is clear that as a proper remedy for the injury complained of, neither an injunction nor an account are necessary or proper.

"The invention claimed is for an improvement in the machinery of grist mills, and the only injury to complainant's rights exists not in using his invention, for it is his interest that all mills should adopt and use it, provided he is paid the price of a license. Such price or value of a license is the true measure of the actual damage suffered, and of the remedy which the patentee can obtain, or has a right to claim in equity."

In Seymour vs. McCormick, 16 How. 480: This Court repudiated the notion that it was a legal presumption that if the defendant had not sold machines all persons who bought would have been compelled to go to the plaintiff, and it then shows that the mode of ascertaining damages must depend upon the nature of the monopoly held. One man may make a close monopoly forbidding all others to supply the demand.

"Where he finds it profitable to exercise his monopoly by selling licenses to make or use his improvement, he has himself fixed the average of his actual damage when his invention has been used without his license.

"When he has himself established the market value of his improvement as separate and distinct from the other machinery with which it is connected, he can have no claim in justice *or equity* to make the profits of the whole machine the measure of his demand. It is only where from the peculiar circumstances of the case no other rule can be found, that the defendants' profits become the measure of the plaintiffs' loss. The question is not what speculatively he may have lost, but what he actually did lose. It is not a necessary legal inference that if all the manufacturers of steam engines and locomotives, who have built and sold engines with a patent cut-off or steam whistle had not made such engines, therefore all the purchasers of engines would have employed the patentee, and that in consequence such patentee is entitled to all the profits of such engines by those who may have used his improvement without license"

In Hodge v. Hudson R. R. Co., 1 Blatch. 165, which was a bill for injunction against using patent car brakes:

"The defendants showed that the complainants had a fixed license price and did not manufacture themselves, but only licensed others, and that they had during the suit tried to get their terms for a license but could not The Court refused to enjoin unless the defendants preferred to be enjoined rather than pay a reasonable license fee during the suit, which must not be more than the regular fee established by the patentee in like cases."

In the present case also, the Court also refused to enjoin, and only exacted a bond for $30,000, as enough to cover all reasonable royalty under the circumstances presented, yet the decree of the Court is for nearly three times the amount of the bond.

In Betts vs. DeVitre, 11 Jurist, N. S., pt. 1, p. 9, the question was whether the Court could make a decree for damages instead of an account.

It appeared that complainant had granted no license, and that he was the sole manufacturer. Vice Ch. Sir William Page Wood, said: "Now the difficulty one sees must be very great where there are no licenses existing. Where there are licenses it would be next to nothing, because there you would simply ascertain the amount sold, and fix the wrong doer with that. Therefore, if a simple case came before me of licenses having been granted, and of a fixed and definite royalty, so that the account would be of great simplicity, I should not feel that the Court was doing that which was plainly within the statute, if it sent the parties to law to ascertain that which it had the means in its own hands of ascertaining.

The following case is a clear and conclusive elucidation of the point that where a man is confined by having established a license fee to a specific recovery of that amount as damages at law, he can get no more profits in equity.

In Penn. vs. Jack., 5 L. R. Eq., 81, the patent was for an improvement in the bearings of shafts for propellers.

Defendant was a manufacturer who introduced the patent into ships which he repaired.

Bill prayed an injunction and account of damages and profits, and an inquiry into the vessels he had fitted with the bearings.

Decree was made for an injunction, and an inquiry as to the damages which the plaintiff had sustained by reason of the use or vending of said invention.

Master reported £147, 10s., made of two items £116, for 2s. and 6d. per horse power for ten ships fitted with the invention, and £31, 10s. for costs and expenses in recovering the same royalty on other vessels fitted by the defendant for which those vessels had paid plaintiff the same royalty.

Master disallowed a claim of £2,005, 15s. 4d., for profit the plaintiff had been deprived of by the defendant's fitting the invention to *these ten vessels*, and also 58 others for which royalty had been paid by the owners.

This amount was determined by an account rendered by the defendant of the profit he had made on the various items of material and labor expended in fitting the several shafts in all 68 cases referred to.

This was the question for argument. Also another question arose as to the extent to which this profit was to be estimated. Whether upon the labor and material only of putting the wooden strips into the propellers, or upon the labor of the whole job of taking out the propeller shafts, fitting them with the strips, and putting them in again, and of all the materials, wood, iron and brass required for such fitting.

Plaintiff claimed to take defendant's profit as a measure of his own loss, being the amount he would have made if he had been employed to fit these ships.

Defendant urged that it could not be proved that plaintiff would have got these jobs. It may be that the reason that defendant got them was, that employers knew that he would use this invention.

Licenses were always given by plaintiff to any builder who applied. The whole world might have done what we have done, on paying 2s. 6d. per horse power.

V. C. Sir W. Page Wood, as to this claim for profits, says:

"Here is a case where the patentee is not in the habit of manufacturing the articles to which the patent applies, or at all events very seldom does so, but he has been in the habit of granting not general ship builders' licenses, but a particular license of 2s. 6d. per horse-power for each ship Defendant, if he had applied as he ought to have done to the plaintiff, would have had to pay 2s. 6d. per horse power for every ship they fitted.

"That is the amount which plaintiff got from everybody else, and it does not appear to me that he is entitled to any more from the defendant.

"It is contended that the plaintiff has lost more than this 2s. 6d. per horse power—he is said to have lost a profit besides. But he has himself estimated this profit at 2s. 6d. per horse power.

"If he had fitted these ships himself he would no doubt have had to run risks of bad debts, bad materials, &c., and he would have expected to make a profit sufficient to cover these risks. But he has shown that he considers he may as well hand over the right to anybody else on being paid 2s. 6d. per horse power.

"He might prevent any ship builder from using this invention at all, and there would then be some chance of business being brought to his yard—but taking everything into consideration he finds that he can afford to surrender all profits from fitting these ships and all chance of profit from being employed to build ships himself upon being paid this royalty.

"The case of Galloway's Patent shows this, that where the assignee of a patentee has himself manufactured the thing of which the patented article forms a part and has made a manufacturing profit, the Court will not look upon that as a profit obtained through the patent, in other words as a part of the monopoly profit.

"In this instance the difficulty would be enormous were I to assume that the plaintiff has really lost any of these jobs by reason of defendants having been employed to do them, when anybody in the trade might have applied for leave to do the same thing, and would have obtained a license from the plaintiff to do so on payment of 2s. 6d. per horse power It seems to me impossible to say that the plaintiff would have obtained any of these jobs if the defendants had only abstained from using his invention until they had obtained his license.

"As the plaintiff considered himself fully compensated by the 2s. 6d. in every case in which he granted a license, it appears to me that where the step has been taken without his leave that is the proper measure of his compensation.

* * * * * *

"If it had been necessary for me to go further into the case I should have said that the plaintiff's claim for compensation for not having had the whole job to do, appears to me quite extravagant. It is clear that he would have been entitled only to the profit of putting in the particular article patented.

"He would have been entitled (if at all) to the profit of fitting in the apparatus—but he cannot be heard to say that he has lost

the job of taking out the propeller and putting it in again, and that consequently he is entitled to a profit upon it."

Let us apply these principles so firmly established to this case, and in applying them, two special matters are to be noticed, and will be found fundamental in the inquiry.

They are these:

I. By a statute law of the State of New Jersey passed Feb. 9, 1870, before the New Jersey Wood Paving Company was incorporated, it was unlawful and impossible for the plaintiffs to have laid any of these pavements—in laying which the profits reported by the Master were made.

That law is as follows (Laws 1870, p. 124):

"SEC. 1. That whenever the City Council of said City shall determine to cause any improvement to be made which shall contemplate the use of any patented process or materials, and the owners of one-half of the property in running feet along the line of the intended improvement shall remonstrate in writing against the use of any specified patent, or for the use of one or two or more specified patents in making such improvements, the said City Council shall award the contract for the work only in accordance with the request of such proportion of owners.

"SEC. 2. It shall be the duty of the Mayor before signing any contract for such work, to ascertain if such contract has been so awarded, and, if not, to return the same to the said City Council unsigned, with the reasons therefor, and thereupon the said City Council shall proceed to reconsider their action, and award the contract in accordance with the provisions of this act."

The land owners did not petition for the Nicolson pavement. They did for the Brocklebank and Trainor. If the latter had not been laid, there is no presumption that the former would. In fact, the presumption is the other way.

II. By the very terms of the grant of the patentee of the Nicolson pavement, under which the plaintiffs claim, the amount of their compensation, in any case where for any reason they cannot do the work themselves, is positively fixed for them in advance at fifteen cents per yard. This is the necessary measure of their damages—or the fixed standard of profits—if they are to be deemed convertible terms. This is all they can gain and all they can lose in any such case—all they can get at law or in equity.

The following is an abstract of the grant, with the provision referred to in full, as found in Plaintiff's Exhibit, No. 3, (p. 57.)

Agreement of license—George T. Bigelow, administrator of Samuel Nicolson and Edward C. Learned and Stephen A. Goodwin of the first part, and Charles E. Jenkins and Wm. T. B. Milliken, of New York, of the second part.

Dated August 14, 1868.

Recites patent August 8, 1854.

Reissue August 20, 1867.

Extension 7 years, from August 8, 1868.

Assigns to Jenkins and Milliken exclusive right and license to construct and lay, or to authorize others to construct and lay pavement throughout New Jersey, except Jersey City, upon the terms and conditions hereinafter contained, upon the prompt and faithful performance of which this contract and the continuance thereof is hereby expressly made to depend.

First. Acknowledge validity of patent.

Second. The parties of second part, their associates and assigns, shall use all reasonable diligence and skill to secure the introduction of the patented pavement into general and extensive use throughout the territory assigned.

Third. They will pay to parties of the first part as compensation or royalty for such exclusive use 16 cents for each square yard, which shall be laid in the territory or in any part thereof, either by parties of the second part, or by any person or persons by them authorized and licensed to lay the said pavement therein.

Fourth. Will lay it skillfully.

Fifth. Will report to Learned and Goodwin, once in three months, the number of yards laid so far as known to them; also the names of any person or persons who may have been licensed by them to lay the said pavement, with date, duration, and terms of said license, and the portions of territory included.

Sixth. The parties of second part shall have right to license any other person to lay pavement in the territory; but if such licenses are made they shall be responsible for the 16 cents royalty, and for making reports, &c.

At the close of agreement is this provision:

"If it shall, by reason of decisions of the courts or otherwise, be found impracticable for the parties of the second part to obtain

contracts for the laying of said pavement in any town or city in said territory to be made with such parties of the second part, or the work of constructing such pavement is required by law to be let under public lettings, open to general competition, then the said parties of the second part agree that they will grant to any such town or city desiring to lay the same a license so to do, upon a license fee, not to exceed the sum of thirty-one cents a square yard; or will publicly authorize any person or persons desiring to bid at such lettings, to lay the same upon the same terms as above stated, of which sum the sum of sixteen cents shall in every case be made payable to the said parties of the first part as hereinbefore provided; but for the fulfillment of any such contracts or licenses made or granted as in this clause provided, the said parties of the second part shall be in nowise responsible."

Jenkins and Milliken, by an agreement, reciting the foregoing assignment and referring to its terms and conditions, granted and assigned to the plaintiffs the exclusive right to lay and *to grant to others* the right to lay the pavement for the entire term.

Thus this Company was bound, whenever they could not lay pavements in Elizabeth, to grant to the City a license to lay it at this rate, and wherever public lettings took place to publicly authorize any one *desiring* to bid, to lay it at the same price.

If the plaintiffs were thus bound by the very terms of their license to authorize the city or the contractors to lay their pavement for this specific price, then this is the only possible measure of their compensation in equity, because it is all that the infringers can make by working without the patent.

If they go on without license, they escape this fee; if they pay it, the plaintiffs have no further cause to complain.

It is not only the measure they were accustomed to establish It is that which they were *bound* to fix. The patentee took care in his assignment to secure the widest use of his invention and the largest amount of royalty to himself, by requiring that the plaintiffs should not shut it up into a jealous monopoly, but should be compelled to allow all desiring to compete, to do so with a specified advantage to the assignee—limited to fifteen cents per yard. With this they must be content in any tribunal. It is their own measure. Where they succeed in getting contracts at high figures they can perhaps make more, but where by law, or by underbidding they fail to get a contract, they must—in the interest of the patentee—volunteer to give all their exclusive right to those who

can do the work, for this definite measure of compensation to themselves.

If therefore the injury the plaintiffs have sustained is the measure of the profits to be decreed in this case, the only inquiry is, what is the extent of that injury? not what have the contractors, in this special and perhaps exceptionally fortunate venture, made by the entire work, but what would restore to the plaintiffs what they have failed to get by reason of the defendants' acts. How could they have failed to gain more than 15 cents per yard?

They could not construct these pavements. It was forbidden by law. They made their bid and lost the contracts. Thus in both aspects the case came within the provisions of the last paragraph of the assignment.

If it is urged that this 15 cent provision is a private contract between others, of which we cannot avail ourselves, the answer is,

It is a condition in their title deed—put there for the benefit of the public in order that it might also result in benefit to the grantor,

And they cannot be heard in equity claiming in contravention of their own title—and in derogation of the objects of the provision.

We are not seeking to enforce the duty the plaintiffs owe to their patentee—we *could* not. If they break that covenant they are liable to their grantor a one. We seek no relief—and ask no judicial action.

But they come into a Court of Equity and ask its aid.

They must *do* equity, and they must have clean hands.

They cannot come here and say "It is true we were bound by our deed to demand only 15 cents and to authorize publicly these defendants to lay the pavements at that price—but that was only an obligation to our own grantor—we chose to break it—we were willing to cheat him, but what is that to you?

"We knew you would make more profit than that, and so we did not tell you that we were bound to license you for that price—we did not even record our deed for fear you would find it out.

"But we waited till you *had* made $2 profit, and now want a Court of Equity to decree that you shall pay us $2 instead of 15 cents,—and we will fight our own battles with our patentee.

"We gain $1.85 on 70,000 yards, which will give us a large fund out of which to pacify him."

Is this a claim that a Court of Equity would hear—a tribunal which, in the language of Judge Daniel in Livingston vs. Woodworth, "refuses to listen even to any save those whose acts and motives are perfectly fair and liberal?"

As against the patentee the plaintiffs are seeking to do a wrong, and a Court of Equity will never assist a wrong doer in effectuating his wrongful purpose.

1 Story Eq., 64, E.

Again. This contract, though between private parties, was of a *quasi* public nature.

It dealt concerning the transactions of towns and cities.

It provided for a certain course of conduct by the grantee towards others—and imposed an obligation on them with respect to others—and in a matter of public concern.

And though this was primarily imposed for the advantage of the grantor, its incidental and necessary result was designed to be the advantage of the public in the extensive and most economical use of the pavement.

When this provision was made and long before, it was the law of New Jersey that *all* contracts for pavements in Elizabeth should be on public lettings open to general competition.

Charter 1863, Sec. 123.

This must be presumed to have been known to Nicolson's administrator.

And the provision must have been made in view of it.

It was therefore equivalent to providing that whenever a pavement was to be laid in the city of Elizabeth, the Nicolson Company must publicly authorize all desiring to bid that they could lay the Nicolson at fifteen cents.

And it must be presumed that unless the plaintiffs violated this duty, all bidders made their bids in view of this provision and in expectation of paying this price and no more.

They are virtually parties to the contract. How then can the plaintiffs ask a Court of Equity to deprive them of this advantage which the plaintiffs' own deed gives them, and to disappoint the expectation which this deed held out, and on which they must be presumed to have acted.

Although they suppressed the deed from the record, equity will not presume that they successfully concealed a provision which it was the obvious interest of the patentee to proclaim.

It nowhere appears that the plaintiffs did *not* publicly authorize all persons in Elizabeth.

It must be presumed that *they did*, and that if they did, the defendants acted accordingly and made their bids on the faith of it. The plaintiffs are therefore estopped from claiming more.

Suppose the contracts had been for Nicolson pavement? The plaintiffs were bound to proclaim to all desiring to bid that they could lay it for 15 cents a yard to the assignee, and 16 to the patentee.

If the defendants had obtained the contracts, as they did these, their whole duty would have been to demand a license on the terms thus publicly proposed. No matter what they might make on the whole work, this was the extent of their disadvantage from not owning the patent, and this was the limit of the plaintiff's possible loss.

The defendants did not believe the Brockelbank and Trainor pavement *was* the Nicolson, or an infringement of it. Therefore they sought no license. They knew, however, that if it was, the limit of their liability was fixed, for the assignment was a public matter which the plaintiffs were bound to proclaim to all the world.

But the plaintiffs believed that this pavement, the only one which could be laid under the law, *was* an infringement of their own.

It was their duty to *facilitate* the laying of the pavement by notifying the defendants of their claim, and advising them of the royalty.

The bidders need not seek *them*; they are bound to make the advances, and to invite competion from all the world.

They have no power to close and control the market. They have only the advantage of 15 cents royalty. Thus far their competitors are hampered, and no farther. They cannot hold over them the threat to mulct them to the extent of the entire profits of the whole structure.

They were bound to *encourage* the laying of the pavement by others.

The very object of the provision in the assignment was to prevent them from holding an exclusive monopoly, and to extend the use of the patented article.

But the plaintiffs, on the contrary, not only made bids themselves without publicly authorizing others, but they served on the Council the petition marked Exhibit 9, asking them to reject the bids for the Brockelbank & Trainor and the Magonagle pavements as infringements, and threatening prosecution. They tried to frighten them off by threats of large damages.

Judge Strong in his opinion characterizes the conduct of the plaintiffs as an attempt to compel the city to give them the contract rather than to their competitors bidding for it, though the bid of their competitors was lowest.

Suppose the defendants having obtained the contracts, and, distrusting their own patent and fearing the plaintiffs' threats, had said to them, "We think our patent is good, but you seem confident it is not. We have fortunate contracts, we shall make two dollars a yard: you cannot under any circumstances get it; we do not want to have any trouble, and can afford to pay your usual royalty; what is it?" Would not the plaintiffs have been bound to tell them, "All we can ask in such a case as this is 15 cents a yard for ourselves and 16 for the patentee; here is the provision of our assignment which we are bound to follow."

Could they have said, "We shall hold you liable for the two dollars you shall make on the whole job as profits"? Could they have concealed their obligation to authorize the work at 15 cents, in the hope that the defendants would take alarm, and that in some other deal with the city they might secure the contracts for themselves?

And if they had, and the defendants had still proceeded with the work, could they have come into a court of equity, and demanded the whole profits as the fruits of their duplicity, and their fraud on their patentee?

Even if they had informed the defendants of their position, and they had refused to pay the royalty—yet it would still remain the only just measure of their compensation.

And much more would it be so when the defendants, relying on their own patent, innocently became in the judgment of the Court infringers, and simply neglected to ask for a license in advance.

Their position might have been worse if the plaintiffs, as they were bound to do, had frankly informed them of the demand they had a right to make, and had authorized them to proceed on those terms and the defendants had rejected the offer. But no such case exists. The case, so far as the defendants are concerned, shows entire good faith, and honest reliance on the protection of their patent duly granted, after that of the plaintiffs.

It cannot be urged that plaintiffs were at liberty to grant licenses or not as they pleased—that they might license elsewhere, but hold an exclusive monopoly in Elizabeth—that they might be willing to license those who asked, but refuse to accept the same fee from those who infringed—for they were bound to *publicly authorize* all desiring to bid.

But if this were not so, it is plain that this royalty was fixed as the definite fee—not subject to any change. There is no proof that any other was ever insisted on—anywhere—before or after the use of the patent—from licensees or infringers.

This matter is alluded to by Sir W. Page Wood in Penn vs. Jack, 5 Law Rep. Eq., page 87, as follows:

"It further occurred to me, that if the plaintiff had been in the habit of saying 'I charge 2s 6d. to all those licensees who do not infringe, but I shall charge 5s. to all those persons who do infringe,' the defendants being in the latter category, might have been fairly chargeable with the 5s. But nothing of that kind is proved to have happened here. All that appears is, that in some instances, where persons have been convicted of infringement, the plaintiff has said: 'I shall not let you off unless you pay me 5s.' But those were instances of special bargains The system does not appear to have been established as a general one with respect to all parties. Or the plaintiff might have said: 'I shall charge

every person who applies to me within the first year or two of my patent, 2s. 6d.; but every one who applies to me afterwards must pay me 5s.' But there is no trace of that."

Now, if these positions are sound, and the defendants have, in fact, infringed the plaintiffs' patent—which we deny—they are merely in the position of having ignorantly used the property of the plaintiffs without permission, which, if they had been advised, and had asked permission, they would have been entitled to obtain at fifteen cents per yard. There is no element of unfair dealing on their part, no ground for any punitive or vindictive remedy.

If they had been pursued at law, the measure of the verdict would have been the definite price of what they unlawfully, though innocently took.

They are attacked in equity, and here—though it is not the forum in which redress for a pure pecuniary injury liquidated in amount, is properly sought—they can simply be held to account as trustees for so much of the profits of their whole work as they ought to have paid the plaintiff for that part of it which invades their rights—for the 15 cents which would have been arranged between them, if the plaintiffs had done their own duty, and had made their lawful demand, instead of trying to frighten the defendants into giving up the work. They are liable only to hand over the money which would have been the undisputed portion of the plaintiffs, if this decree had been made in advance and the matter had been fairly understood between them.

If Judge Strong had been of opinion that the defendants' patent was an infringement, then they would only have been obliged to go and ask the plaintiffs for a license at 15 cents, and now that this Court has so decided, they have only to pay the same sum—holding it in a sort of involuntary trust, now for the first time ascertained to exist.

When we speak of these cases proceeding on the theory of a trust, it is only a vague way of reaching the true relations of the parties. There is strictly no trust relation between them. None has ever been created or assumed by any voluntary act. It has

been called the *fiction* of a trust—which is saying that it is no trust at all, but only a semblance of one.

It is rather, in this instance at least, the case of money had and received *by mistake*, for the use of the plaintiffs.

But by whatever name we call it, the relation of the parties is simply that of one man involuntarily and innocently using the property of another, and bound to account for its value, and that value so definitely fixed that the owner is bound not to accept any more.

The plaintiffs' patent when used by others in cases where *they* could not use it, is worth to them by their own standard, just 15 cents per yard; and he who without fraud converts it to his own use is bound to pay just that price, precisely as, if he had converted U. S. notes, he would be bound to repay just their face in lawful money, and no more, no matter what profit he may have been fortunate enough to make by combining it with his own advantages and skill.

We can find a closer analogy than that of a trust, in the case where a plaintiff in equity seeks the aid of the Court against an innocent person who has made improvements on land supposing himself to be the absolute owner. In such cases, aid will be given to him only upon the terms that he shall make due compensation to such innocent person, to the extent of the benefits which will be derived from the improvements.

Even if the plaintiff has not concealed his title, or used any fraud, if he seeks from an innocent person an account of the rents and profits of an estate, on which the latter has made improvements, without any notice or defect of title, a Court of Equity in decreeing an account, will allow him to deduct or recoup a due compensation for improvements.

2 Story, Eq., § 799.

And in Green v. Biddle, 8 Wh. 77, the fraudulent aspect of such a case is thus stated:

"If the equitable owner of land who is conusant of his right, will stand by and see another occupy it and make improvements without asserting his right, he shall not in equity enrich himself by the loss of another, which it was in his power to prevent, but must be satisfied with the value of the land independent of the improvements."

Applying these principles it is plain that in no aspect can the plaintiffs claim more than their own fixed price of their patent.

The defendants innocently used it, and simply combined it with their own capital, labor and skill used on a large scale. They deny that its use increased their profits. They did not even know they were using it. The plaintiffs ask, as their just relief in equity, the entire profits—the whole results of the defendants' labor and skill. A Court of Equity must reply,—you are entitled to the value of your property—as fixed by yourselves, and no more.

But more than this,—the plaintiffs in effect concealed their true position, by failing to give public permission to the city and to the defendants to lay the pavement at the settled price.

They stood by without asserting—and, in fact, suppressing their real rights. And a Court of Equity will not now allow them to enrich themselves, by grasping all the profits the defendants have made in their whole work. They will not be allowed through a proceeding in equity to extort $90,000 for that which they were bound to volunteer to sell for $10,000.

This was evidently Judge Strong's view when he said in his opinion on the application for injunction (Record, 49), after requiring the defendants to give bond for thirty thousand dollars—"the complainants cannot be injured by our refusal to enjoin the defendants now, especially if the refusal be upon the terms with which the defendants offer to comply. On the contrary, it may be for their interest that this pavement be laid. The proofs show that the Nicolson pavement cannot be laid on Newark avenue The law of the State and the action of the property owners on the line of the avenue forbid it. But if in putting down the Brockelbank and Trainor pavement, the Nicolson improvement is used as the complainants contend it will be, they receive compensation for its use."

The contracts for these pavements were all made before this action was taken. The quantity of work to be done could be readily estimated. The defendants offered to give bond in the amount fixed as an ample margin for possible loss to the plaintiffs. No attempt was made to fix the bond at a sum sufficient to cover probable profits on the whole work. The Judge had in mind the "compensation for the use of the Nicolson improvement," and that

alone. And the plaintiffs knew—and were bound to declare—what the compensation was, as settled and defined in their grant.

Thus, if the foregoing positions are sound, the plaintiffs would be entitled to only 15 cents per yard, or about $10,500 if the defendants had actually laid the Nicolson pavement entire; if the land owners had asked for it and the Wood Paving Company had secured the contracts by making the lowest bid.

But there is another aspect of the case still more unfavorable to the plaintiffs.

All that has been said would be true if it had been lawful to lay the Nicolson, and it had in fact been laid without license.

But it was wholly unlawful to lay it. The land owners refused it, and no valid contract could have been made for it. If any had been made, payment of the price could have been enjoined. These payments were permitted and paid for really because they were not, or were believed not to be, the Nicolson pavement.

If the decision of the Court on the subject could have been anticipated, it may be assumed that no pavement would have been laid. Certainly the Nicolson would not.

If, therefore, the injury suffered by the plaintiffs is the measure of their compensation, they have suffered nothing, and are entitled to no compensation They are just where they would have been if the streets were yet unpaved, or if they had been paved with another patent pavement desired by the land owners, and not containing their improvement.

If the defendants have ignorantly used the plaintiffs' improvement, which it was unlawful to use, and which they derived no actual advantage from using, how can the plaintiffs claim to treat them as trustees for profits which they never could have reaped otherwise?

Is it equitable that the mistake of the defendants acting under the sanction of the patent office, and with the strongly implied sanction of the Judge, should enure to the benefit of the plaintiffs, and put money in their pockets against the express provisions of law?

It was unlawful for any one to lay the Nicolson pavement. If it was in fact laid, it was under misapprehension, in defiance of law, and against the wishes of the land owners. Will a Court of Equity, under these circumstances, hold that the plaintiffs shall derive the same profits as if it had been lawful to do it, and it had been done by themselves or their licensees?

Will it not rather say, "You have lost nothing, you must not be heard in complaint of the law; seek your profits where you may lawfully receive them?"

Suppose it were unlawful to lay wooden pavement at all in New Jersey, and that, notwithstanding, some infringer, denying the law, had laid the Nicolson and made a profit by his wrong? Could the patentee come into a Court of Equity and seek to share the spoils? Would he not be warned that this State was a closed domain so far as his patent was concerned?

On any theory of trusts concerning patent profits, it must be only those profits of which the patentee has possibly been deprived, which can be the subject of a remedy in equity.

Here the plaintiffs have suffered no wrong; they labor simply under the misfortune that their pavement did not commend itself to the public, and was not permitted by the law.

They have lost no more than if their pavement had been laid by the defendants in Japan.

These considerations were earnestly presented to the Court below.

The learned Judge alludes to the two conditions upon which the licensees agreed with the patentees to permit other parties to lay the pavement, viz:

1st. Where by reason of the decisions of the courts or otherwise it shall be impracticable for the licensees to obtain contracts for laying pavements in any town or city, and

2d. Where the work was required to be under public lettings.

And he insists that neither of these conditions arose.

As to the first he refers to the fact that the Nicolson Company did obtain contracts both before and after the pavements in question were laid, to lay their pavements in *other* streets in Elizabeth, as conclusive proof that the first condition did not exist.

This is a narrow view. The condition is that where for any

cause—decisions of courts or *otherwise*—they cannot get contracts they must license others for 31 cents.

It is quite clear that for *some* cause they could not get these contracts; what the cause was is wholly immaterial.

The notice served by the plaintiffs upon the city (Record, 115) shows beyond controversy that in the case of the work there referred to, they did find it impracticable to get it.

And thereupon it was their duty, if they deemed the pavement of their rivals to be in fact their own, to demand the prescribed license fee and to grant the license.

Instead of this they concealed their position, endeavored to intimidate the city, and resorted to litigation for the profits of the contracts which they found it impracticable to obtain.

As to the second condition the learned Judge assumes that there were no public lettings. In this he is evidently in error. The affidavit of Geo. W. Tubbs (Record, 35) shows that the city regularly advertised for proposals.

The notice served by the plaintiffs asserts the fact.

The law, long existing, required it.

It is true that the act of February 9, 1870, required that no patented pavement should be laid without the consent of a majority of the owners—a very proper provision.

But it did not preclude public lettings for such pavement as should be desired.

This condition also existed, and therefore the plaintiffs were bound to authorize the Brockelbank and Trainor pavement at the prescribed fee, if it was in fact their own, and the owners desired to have it in that form.

The learned Judge seems to think it proper to go behind this act of the legislature, to trace it to its source, to find some improper motive for its passage, and to ascribe it to the defendants, as a reason why they should be punished by this enormous decree.

It is enough to say that there is no proof whatever of any such matters. The Judge allowed himself to be led into such inferences, by the earnest assertions and imputations of counsel.

The record may be searched in vain for any proof of them.

And even if some gentlemen, desiring to control the paving of their own premises, did ask for the law, it was, when enacted, *the law*, and could not be impugned.

It cannot be repealed by a suspicion.

A corporation afterwards formed, and acting under it, cannot be vicariously punished in damages for the sins of some unknown lobbyist, and for the benefit of a rival company.

The plaintiffs come into Court to seek equity for themselves—not the punishment of public transgressors.

All they can claim is what the defendants hold in trust for them under the proofs in the cause.

And if anything is so held, it can be no more than the money they could have required from others for doing this work which they could not do themselves.

But now, assuming, for the purposes of the argument, that the law permitted the Nicolson pavement—that the plaintiffs were the patentees with no established license fee, seeking their profits by constructing pavements themselves—and that the Brockelbank and Trainor pavement contains their combination, we insist that, on these wide assumptions, the Master's report and the decree founded thereon are wholly erroneous.

The report does not even purport to do what the decree required. The decree was for profits *in consequence* of the infringement. The report is for the total profits of the company *in the infringement.*

There is no attempt whatever to discriminate as to the profits due to the particular means by which the plaintiffs' rights were alleged to be invaded.

The process of the Master has the merit of simplifying a problem supposed to be difficult. He sums up the total profits of a business in which a patented improvement has been used and awards them all to the patentee, though they amount to nine times the sum which the infringer was entitled to buy the improvement for.

But in doing this entire work, for the total profits of which this decree was made, the Wood Paving Company believed that they were using, lawfully, the improvements described in the Brockelbank and Trainor patent.

If it must be held that in so doing they infringed the Nicolson patent, it cannot be denied that they used also something more.

The infringement, if any, consisted in the use of the strips and blocks as described in Nicolson's patent, deriving the advantage of using the strips to define the distance at which the next row of blocks must be placed.

If they must be held liable to account for that advantage, it by no means follows that they must pay over the whole profits of the work. It was only because they had also the advantage of the Brockelbank and Trainor improvements, that the pavements were laid at all.

Those improvements consisted of forming the blocks with a dove-tail rebate, and using strips with beveled sides fitted to the rebates.

And this was done in such a manner as to make a mechanically different structure, and to produce a different result.

It obviated the most serious difficulties in the Nicolson—those defects which have led to its disuse, especially the working up of the strip.

It strengthened the whole structure by weaving together all its parts. It not only held the strip in its place, but distributed the pressure over a larger surface.

And thus, even if the construction of this pavement must be held to embrace the Nicolson invention, it added to it those features which led the Patent Office to extend its protection to the inventors of the Brockelbank and Trainor improvement.

This is clearly shown by Mr. Justice Strong in his opinion denying the preliminary injunction.

He says: "It is very evident that the combination of the Brockelbank and Trainor patent works a different result in two important particulars from that obtained by the Nicolson invention. It distributes the pressure upon the surface of the pavement over a larger base, and it guards against the displacement of the strips or short blocks that separate the long blocks. This is

effected by the defined forms of the constituents of the combination. The rebated long block, and the strip or short block so fashioned as to be fitted to the rebate, are perhaps something more than mere equivalents."

And Judge Nixon, in his opinion, expressly stated the same thing in stronger terms, after full hearing of the whole case. He says:

"The complainants added a new feature to the Nicolson combination. They rebated the blocks on one or both sides in a dovetail or vertical form, and bevelled the strips to suit the rebates; which addition, it is claimed, made a mechanically different structure, and was an improvement, in that it guarded against the displacement of the strips or short blocks, and distributed the pressure upon the pavement over a larger surface. We are inclined to believe that there is good foundation for this claim, whether we look for it in the evidence in the case or in the well ascertained principles of mechanics, and that the Brockelbank and Trainor patent, by this addition, has improved upon the Nicolson combination. (p. 305.)

The defects in the Nicolson pavement which the improvement, invented by Brockelbank and Trainor was designed to obviate, are clearly shown in the testimony of

William T. B. Milliken,	page	223.
William B. Green,	"	225.
Theodore Reeves,	"	227.
Philip H. Traver,	"	228.
James M. Titus,	"	230.
Greenleaf Stackpole,	"	233.
James K. Thompson,	"	146.

In fact it is shown by these witnesses that the DeGolyer, or Stead pavement, in which the strips were used only as spacers, and then removed, was extensively substituted for the Nicolson in order to cure these admitted defects.

Now the Wood Paving Company obtained a license from Brockelbank and Trainor and constructed all these pavements under that patent in order to gain these manifest advantages.

And by doing so they produced a structure functionally different, and they gave to the work a new and different mechanical character, and largely added to its durability and strength, and, therefore, to its value.

If in so doing they infringed the Nicolson patent, they must account for that portion of the profit which was derived from that infringement—but not for the entire profits of the work—nor for any part of the profit which grew out of the use of the Brockelbank and Trainor improvements.

And it must be shown affirmatively what that part was, or else the recovery must be nominal.

The case of Mowry vs. Whitney (14 Wall., 651) was decided shortly before the decree in this case was made, and the later cases have confirmed and extended the rule there adopted.

That rule is compressed into the fewest possible words in the case of *Mevs vs. Conover*, October Term, 1876:

"In the ascertainment of profits made by an infringer of a patented invention the rule is a plain one. The profits are not all he made in the business in which he used the invention, but they are the worth of the advantage he gained by such use, or, in other words, they are the fruits of that advantage."

Here there was no attempt to prove the worth of the advantage gained by the Paving Company by the use of Nicolson's improvement. The Master simply ascertained by the books of the Company and testimony of its officers how much they made in the entire business, and the decree was entered for that.

It will not avail to say that it was difficult or even impossible to make such proof. If difficult, it must be done, or the desired profits cannot be ascertained. If impossible, the effort to get a decree for profits must be abandoned and the recovery must be nominal, unless they can prove the value of an accustomed royalty and be content with that.

In Gould Manufacturing Co. vs. Cowing, 12 Off. Gaz., 942, the patent was for an improvement for pumps in oil wells. The

validity of the patent had been established. It had been referred to the Master for account of profits. He reported $47.71 on each of 298 pumps, and arrived at the result precisely as the Master did in this case,—by taking the expenses of making and selling the pumps, and deducting it from the prices received, and by proving that the plaintiffs were ready to fill the orders the defendant had taken.

On exceptions to this report, Mr. Justice Hunt held the rule adopted to be erroneous, showing that numerous parts of pumps were in general use prior to the patent, and were free to be used by the defendant—that the damages could not exceed the profits upon such improvement,—and that the plaintiffs having failed to show the profits arising from the use of the improvement, the recovery could be only nominal. (This opinion is found in 12 Blatchford, 243.)

But subsequently the plaintiff was allowed further opportunity to make proof under the rule laid down. The Master made substantially the same report again, founding it upon the proof that after the plaintiffs' pump had been introduced other pumps could not be sold.

This report came up on exceptions before Judge Johnson, in September, 1877. He sustained the exceptions and reduced it to a nominal amount. He said that it would not avail to say that proof could not be made of a fact declared to be essential to recovery; and that the consequence was that the party on whom the burden rests must fail.

He referred also to a decision of Mr. Justice Hunt to the same effect in Black vs. Munson, filed June 19, 1877, not reported.

These decisions were in accordance with the views of this Court expressed in Blake vs. Robertson, 4 Otto, 728, in which a patent for improvements in machines for crushing stones was sustained, and it was held 'that the burden of proof of damages is on the complainant, and that where no license fee is shown, although it appears that the complainant made a profit of $40 per inch on the width of the jaws of machines sold by him, yet since they embraced inventions covered by patents other than those infringed, nominal damages only could be recovered in the absence of proof

of how much of the profit was due to the other patents, or how much of it was manufacturers' profit.

Upon these principles so definitely established, it is clear that the recovery in this case must be nominal, or at most for the amount of the license fee.

A pavement is a machine, in the classification of the patent laws. Like a pump, it is a machine that has been in use for centuries.

Almost all the parts of Nicolson's wooden pavement are shown by the proofs to have been in use and open to the public in various forms.

The blocks in every shape, the grooves in every direction and form, the foundation, the filling—in fact all the parts going to make up the structure and adapt it to its use, have been employed for many years, and have been open to public use.

Nicolson invented an improvement. He call it in his schedule, "a new and useful improvement in wooden pavements." (Page 172.) He added it in different forms, to the well-known features of wooden pavements, and he received a patent for it.

Brockelbank and Trainor also invented an improvement, and applied it to the same well-known structure. He also received a patent for his.

The defendants, if they infringe Nicolson's, have constructed pavements, containing both patented improvements, as the pumps were constructed in the oil wells, and as the stone crushers were constructed in the case of Blake vs. Robertson.

It is essential therefore that the complainants should make definite proof of the profits actually derived from *their* improvement, as distinguished from that due to Brockelbank and Trainor, or to manufacturers' profit.

Not having done so, they must fail.

This point was strongly urged in the exceptions, and they had full opportunity to correct the error.

They refused to avail themselves of it, and insisted on a decree which not only declared the actual manufacturers liable for all the profits of their entire business, but held that the City was bound

to pay such profits, including those made on work entirely outside of its boundaries.

On the contrary, although the Judge as stated above had admitted that the defendants had used a valuable addition in connection with the patent which he held them to infringe, he held that the burden was upon them to show what part of their general profits belonged to this addition. (p. 305.)

When the defendants asked for an allowance for the benefits contributed to the complainants' invention by the addition of Brockelbank and Trainor's improvement, the complainants resisted and the Court refused it, on the ground that "the burden of proof was on the defendants to show the extent of the advantages which were added, and the proportion of the profits which were made by their improvement of the Nicolson combination." (Judge Nixon's opinion, p. 310.)

Moreover, when the defendants claimed a specific deduction of $31,611,92 from the gross profits, for the actual manufacturers' profit on the various materials and labor used and employed in the construction of the pavements, it was disallowed by the Master, and his report was sustained by the Court.

Thus the rules established in the cases cited above were totally reversed.

The complainants were relieved from the burden of proving profits actually made by using their invention, and were allowed to absorb the entire profits of the business, and the whole advantage of the Brockelbank and Trainor improvement, and all the profits on the purchase of materials.

Upon the grounds now definitely settled here, and followed in the cases referred to in New York, the decree is plainly erroneous, and ought to be reversed for this error in computing the profits.

A. Q. KEASBEY,
of Counsel with Appellants.

Supreme Court of the United States.

No. 203.

THE AMERICAN NICOLSON PAVEMENT COMPANY,

Respondent,

vs.

THE CITY OF ELIZABETH, *et al.*,

Appellants.

BRIEF FOR RESPONDENT.

B. WILLIAMSON,
C. A. SEWARD,
For Respondent.

NEW YORK:
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BRIEF FOR RESPONDENT.

Chronology of the Case.

THE PATENT.

Caveat filed, August 4th, 1847 (p. 114).

Original patent, August 8th, 1854 (p. 172).

Reisssue thereof, December 1st, 1863 (p. 175).

Reissue thereof, August 20th, 1867 (pp. 56, 57, 9–12).

Charles Trainor testifies, April 4, 1868, (p. 191) to the value of Nicolson's invention; to the great saving which it effects to the public, and in the wear and tear of horses and carriages.

John W. Brocklebank testifies, April 6, 1868 (p. 189), to the great value and utility of the Nicolson pavement, and to its great saving in the wear and tear of horses and carriages.

Certificate of Extension for seven years, August 8th, 1868 (pp. 57, 12).

The Title.

Bigelow, administrator, to Goodwin & Learned, one-third interest, July 7, 1868 (pp. 57, 61).

Bigelow, Goodwin & Learned, to Jenkins & Milliken, August 14th, 1868—"the sole and exclusive right and license to construct and lay, or to authorize or license others to construct and lay, the said patented pavement in all the cities, towns and places within the State of New Jersey, except the city of Jersey City" (pp. 57, 63).

Jenkins & Milliken, September 5, 1868, to the American Nicolson Pavement Company, "the sole and exclusive right and license to construct and lay, and to authorize others to construct and lay said patented pavement within the State of New Jersey, except Jersey City, during the entire term of the said extended term of the said patent, upon the terms, conditions and stipulations *hereinafter contained*" (pp. 57, 66). Recorded March 16th, 1869 (p. 66).

The Acts of the Plaintiff.

Certificate of Incorporation, February 18, 1868, "to manufacture, lay and sell in any and all parts of the United States, in which the said Company shall obtain the right so to do, a certain wooden block pavement, known as the Nicolson pavement,

a patent for which has heretofore been issued to Samuel Nicolson, the inventor thereof, and to enter into, execute, and perform contracts for the manufacture, laying and selling of the same" (p. 60).

A contract with the City of Elizabeth for paving Broad Street, 9344 square yards, $4.55 per yard, December 4, 1868 (p. 235).

A contract for paving Grove Street, 1620 square yards, $4.50 per yard, July 1st, 1869 (p. 234).

A contract for paving Cherry Street, 4264 square yards, $4.50 per yard, July 14, 1869 (p. 235).

A contract for paving Grier Avenue, 10,654 square yards, $4.60 per yard, November 15, 1869 (p. 235).

A contract for paving Grove Street, 40,006 square yards, $4.50 per yard, July 5, 1870 (p. 234).

A contract for paving Reid Street, 10,072 square yards, $4.50 per yard, July 26, 1870 (p. 234).

A contract for paving Broad Street, $7,474\frac{3}{10}$ square yards, $4.50 per yard, August 10, 1870 (p. 234).

A contract for paving New York Avenue, $5,103\frac{4}{10}$ square yards, $4.50 per yard, September 7, 1870 (p. 235).

A contract for paving South Street, 3,762 square yards, $4.50 per yard, September 7, 1870 (p. 235).

A contract for paving Bay Way 29,986 square yards, $4.50 per yard, December 5, 1870 (p. 235).

A contract for paving Spring Street, 19,642 square yards, $4.50 per yard, December 31, 1870 (p. 235).

A contract for paving Sheridan Avenue, 13,172 square yards, $4.50 per yard, June 5, 1871 (p. 235).

Petition to the City Council of Elizabeth, November 17, 1869, reciting that, in compliance with a publication made by the City Council requesting bids to

be made for laying wooden pavements in said city, the petitioners had made and filed a statement, being a bid by them for the construction of such pavement; that parties desiring to act under the authority of the said Brocklebank & Trainor had also put in bids for laying the said two pavements; therefore the petitioners requested that such last named bid might be rejected and the contract awarded to them, for the following reasons: 1st. The Nicolson pavement was the best. 2d. *The process of Brocklebank & Trainor was an infringement.* 3d. That such pavement had already been sued as an infringement in the City of Hartford, and it was unjust to compel a new suit. 4th. That the validity of the Nicolson Patent had been sustained by the Circuit Court of the Northern District of Illinois * (p. 115).

The plaintiff commenced this suit April 29th, 1870 (p. 1).

The Acts of the Defendants.

Brocklebank & Trainor signed their specification for their patent December 14, 1868. It describes the Nicholson pavement, and, plus that, the rebating of the large blocks, and the fitting of the cross-strips thereto (pp. 178–180).

Their patent was issued January 12, 1869 (p. 178).

In 1866, 1867, and 1868—

"We obtained control of large tracts of land in the City of Elizabeth, laid the same out into plots, running streets through said land, *with the intention*

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* Note.—The plaintiff, after this notice, received seven further contracts from the City of Elizabeth, for laying over 90,000 yards of the Nicolson pavement, as is shown by the dates of the contracts already specified.

of paving and otherwise improving said streets. * * We selected the Brocklebank & Trainor Patent Wood Pavement, as best suited to our purpose" (p. 153).

By the 123d section of the amendment to the Charter of the City, approved March 4, 1863, it was enacted that all contracts for doing work or furnishing materials should be advertised for three weeks, and should at all times be given to the lowest bidder (p. 307).

On the 4th of March, 1869, Brocklebank & Trainor executed a license under their said patent of January 12, 1869, to William W. Crane, George W. Tubbs and Augustus C. Kellogg, for the exclusive use of the patented privileges within the State of New Jersey (pp. 266, 267).

A supplement to the City Charter was passed Feb. 9, 1870, to the effect that, when the City intended to use any patented improvement in the construction of a street, and the owners of one-half of the property on the line of such street should remonstrate against or petition for the use of such improvement, the City Council should award the contract only in accordance with the request of such proportion of such owners (p. 307).

On the 18th of February, 1870, the City entered into a contract with Tubbs for paving Garden Street. At that time the petition of the plaintiff, alleging that the Brocklebank & Trainor pavement was an infringement, was before the City Council. Thereupon the said Tubbs and Crane indemnified the City by a bond of $50,000, of which the condition was in these words:

"The condition of the above obligation is that, whereas the said George W. Tubbs has made a proposition to the City Council of said city of Elizabeth

for paving Garden Street with wooden pavement, under the Brocklebank & Trainor patent, now the condition of this obligation is such that, if the said Tubbs and Crane shall fully indemnify and save said city harmless against all damages, suits, costs and charges that said city may sustain *on account of any alleged infringement of what is known as the Nicolson patent*, or of any other patent, or *that may be recovered by the Nicolson Wood Paving Company*, or by any other corporation, association, persons or person, in consequence of awarding the contract for paving said street to said Tubbs, then this obligation shall be void" (pp. 117, 155).

Tubbs also gave the City (p. 36) two other bonds; one for $25,000 and one for $15,000. The latter was returned. The two former for $75,000 were retained, and are now held by the City as security against this suit. Tubbs and Crane were on such bond (p. 117), and Tubbs is on the present appeal bond.

On the 17th of March, 1870, the New Jersey Wood Paving Company was formed, with a capital of $250,000, and a prohibition against commencing business until $10,000 in cash was subscribed and paid in, and with permission to receive patent rights at a valuation to be agreed upon in lieu of cash subscriptions (p. 307).

The persons interested in this company were Anthony W. Dimmock, Andrew Dutcher, Augustus C. Kellogg, William W. Crane, George W. Tubbs, Amos Clark, Jr., Edward G. Brown, Edward S. Atwater, Samuel S. Moore, John Davidson, Michael Doyle, Aaron W. Kellogg (p. 237).

On the 1st of June, 1870, Crane, Tubbs and Kellogg assigned to the New Jersey Wood Paving Company their license from Brocklebank & Trainor for the consideration of $145,000 (p. 268).

This was paid for by the issuance of $145,000 of the capital stock to Crane, Tubbs & Kellogg. No

other shares were issued, and no other cash was ever paid in by the shareholders (pp. 237, 256).

The New Jersey Wood Paving Company became the assignees of Tubbs' contract with the City for paving Garden Street, and the contracting parties in five other contracts with the City for laying the Brocklebank & Trainor pavement on North, Newark, Sherman and Grier Avenues, and Garden and Grove Streets (pp. 211, 237), being two of the avenues and one of the streets on which the plaintiff also received contracts for laying the Nicolson pavement, viz., Grove Street, and Sherman and Grier Avenues; all of these were also for $4.50 per square yard.

These contracts were expensive. It cost $21,409.23 to secure them. Tubbs said:

"There is an item for contingencies, $21,409.23, that is made up from the accounts, and *was actually paid for getting contracts.* The contracts *under which the pavement in question was laid.*" Part was paid in cash and part was paid in checks (*Amendments to Record, pp.* 10, 11, *fols.* 30, 32; pp. 234, 235).

The directors of the New Jersey Company owned the whole of its stock.

When they formed their company

"it was agreed with the parties who got the charter, that when we paved in front of their property, they should have the benefit of 50 cents a yard. That amount, $14,709.66, was thus paid back to them" (p. 237),

i. e., as a consideration for their petitioning to have the Brocklebank & Trainor pavement laid down. Anthony W. Dimmock, who it is to be supposed petitioned for Grove and Garden Streets, and Grier Avenue, received under this arrangement $5,148.30; A. C. Kellogg, for his representation of Newark Avenue, $182.22; Crane, Tubbs

& Co., for their representation of Newark Avenue, $2,278.89; Andrew Dutcher, for his representation of Garden Street, $200; and Messrs. Doe,* Westcott and Graham, for their representation of Newark and North Avenues, and Grove Street, $7,431.92; or, in all, $15,241.33 (p. 245), instead of $14,709.66 (p. 245), for their having petitioned against the Nicolson, and in favor of the Brocklebank & Trainor patent.

This amount

"was distributed in proportion to the number of front feet that they owned on a street that was paved. These moneys came from the funds of the company, and the funds of the company came from the payments of the city on the contracts in evidence" (p. 242).

The petitions (*Admts.*, p. 17, fol. 49) for paving these streets are annexed to the stipulation, with the exhibits which have not yet been printed. They show that A. Dutcher and A. W. Dimmock were the petitioners as to Garden and Grove Streets; that Davidson Crane & Kellogg were petitioners as to North Avenue; that Crane, Tubbs & Co. and Davidson were the petitioners as to Newark Avenue; and that A. W. Dimmock was the only petitioner as to Grier Avenue.

The company paid to Brocklebank & Trainor, as the royalty of 20 cents per square yard stipulated in the license (p. 267), the sum of $13,868.56 (pp. 237 to 242).

On the 22d of April, 1871, the Wood Paving Company (p. 265), passed this resolution:

"Be it resolved by the directors, that they assume all the responsibility of said Tubbs in said suit, and

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* Note.—Doe was a partner of Davidson, who was a director and stockholder (pp. 254, 237).

that the entire assets, stock, tools, fixtures and property belonging to said company be assigned to said Tubbs to secure him against any costs or damage which may be recovered against him by the American Nicolson Pavement Company; provided that in case said suits should be decided against said American Nicolson Pavement Company, then such assignment be null and void."

On the 2d November, 1874, the City Council of Elizabeth passed (p. 323) the following preamble and resolution:

"*Whereas*, the United States Circuit Court for the District of New Jersey has affirmed, in the matter of the decree against the city of Elizabeth *et al.*, that, in appealing this cause to the United States Supreme Court, sureties to the amount of one hundred thousand dollars must be given: therefore, be it

Resolved, that the Mayor be, and hereby is, directed and empowered to execute a bond of indemnity to any person or persons becoming surety on the appeal bond, in pursuance of the order of the Court, to hold such person or persons harmless should the appeal not be prosecuted to effect by the defendants in the suit in said United States Supreme Court."

The charter of the Wood Paving Company, approved March 17, 1870, was offered in evidence by the plaintiff before the Master (p. 247).

The other statutes referred to by the Court below in its opinion (p. 307), viz., the charter of the city of Elizabeth, March 4, 1863, and the supplement thereto of February 9, 1870, were introduced before the Master (pp. 293, 300). As they are not printed in the record further than the quotations therefrom in the opinion of the Court below, they are printed as an appendix to this Brief.

The Motion for an Injunction.

The plaintiff moved for an injunction before Mr. Justice Strong, at Chambers, in the city of Philadelphia, by consent, and the motion was denied in an opinion which contained this language:

"We come the more readily to this conclusion because the complainants cannot be injured by our refusal to enjoin the defendants now, especially if the refusal be upon terms with which the defendants offer to comply. On the contrary, it may be for their interest that the pavement be laid. The proofs show that the Nicolson pavement cannot be laid on Newark Avenue.* The law of the State and the action of the property-holders on the line of the Avenue forbid it. But if, in putting down the Brocklebank & Trainor pavement, the Nicolson improvement is used, as the complainants contend it will be, they may recover compensation for its use." (p. 49.)

This portion of the opinion was founded upon the *ex parte* affidavit of Tubbs (p. 36), who said as follows:

"That the property-holders along the line of the proposed wide avenue to Newark petitioned almost unanimously (none objecting thereto) to have said avenue paved with the Brocklebank & Trainor wood pavement; that the City Council granted the prayers of the petitioners, and, in a manner prescribed by the city charter, awarded me the contract for paving said avenue, called Newark Avenue."

Tubbs omitted to call the attention of Mr. Justice Strong to the fact, which subsequently appeared, that Mr. Kellogg and Mr. Doe received $7,251.36 as

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* Note.—The petitioners for the laying of the Brocklebank & Trainor pavement on Newark Avenue were Crane, Tubbs & Co., Davidson & Doe, and A. C. Kellogg, his partner, who severally received 50 cents per square yard for their signatures.

a consideration for their petitioning as property-holders, whereby it was made illegal for the city to award the contract to the Nicolson Company, which was then laying its pavement in almost every other street in the city.

Davidson (p. 26) also gave an *ex parte* affidavit, which was used before Mr. Justice Strong, in which it was stated as follows:

"Deponent has purchased land on Newark Avenue to an amount exceeding $100,000. Deponent favored the Brocklebank & Trainor wooden pavement, and petitioned the Common Council of said city to have the same paved with the said Brocklebank pavement."

Davidson suppressed the fact, testified to by S. S. Moore, the bookkeeper of the New Jersey Wood Paving Company (p. 254), that he (Davidson) owned the land in partnership with Doe, and that he (Davidson) was a stockholder in the company, and that Doe received for Davidson's "favoring" the Brocklebank & Trainor pavement on Newark Avenue, $4,790.25.

Crane's *ex parte* affidavit was also used before Mr. Justice Strong (p. 38). He said:

"In connection with two other men, we have purchased valuable lands on a certain avenue, called Newark Avenue. * * I investigated the different modes of wood pavement, and was fully convinced, after a careful consideration, of the superiority of the Brocklebank & Trainor wood pavement, and petitioned to the City authorities to have said avenue paved with the above pavement."

Crane omitted to state that the "two other men" were Tubbs & Kellogg, his partners under the firm name of Crane, Tubbs & Co. (pp. 237, 238), and that that firm received for its petition to have the "supe-

rior" Brocklebank & Trainor pavement laid on Newark Avenue (p. 245) the sum of $2,278.89.

How the contract came to be given by the City adversely to the Nicolson Pavement Company has already found a suggestive answer in the fact that in the original account which Tubbs produced before the Master, there was an item of $21,409.23 for "contingencies," to which an objection was taken (p. 237). Tubbs and his bookkeeper, Moore, both testified as to this alleged disbursement. Subsequently (p. 248) the counsel for the defendant gave

"notice that he strikes out the items called 'contingencies,' referred to by the witness George W. Tubbs, being the sum named as $21,409.23, and also strikes out all the testimony of Mr. Moore and Mr. Tubbs relating thereto."

The giving of this notice ought not to have had any other effect than withdrawing the statement from the consideration of the Master. It did not authorize the elimination of the testimony from the record, and it stands there as the significant cause of this litigation.

Tubbs did not state in his affidavit used before Mr. Justice Strong, what he did state on his examination before the Master, and from which it appears (*Amdts., p.* 14, *fol.* 42) that the draft of the amendment to the Charter of the City of Elizabeth, requiring the assent or petition of property owners, was shown to Tubbs on the day that it was said it was going to be presented to the Legislature. Tubbs continued:

"Q. Have you not said here this morning that Dr. James S. Green concocted the thing, or words to that effect? A. I do not know who concocted it. I said that Dr. Green was interested in the Brockle-

bank & Trainor pavement at that time. The origin of the law I know nothing about, or who started it. (Question repeated.) A. No, sir; not in that meaning. Q. Was not James S. Green one of the persons named in the Act incorporating the New Jersey Wood Paving Company? A. I think he was."

This was amply sufficient as a foundation for the remark in the opinion of the Court below (p. 309), that

"The Legislature of the State was applied to by certain gentlemen, who obtained the enactment of a law that practically shut up the City to award the work to the licensees of the Brocklebank & Trainor Patent; for, by its provisions, a majority of the landholders controlled the selection, and it was made their interest to demand the laying of that pavement by having refunded to them a portion of the profits derived from the whole work. Large profits were realized by the licensees from these contracts, but realized from the use of the complainant's invention. Will the Court allow the bulk of these profits to be retained by the infringers *because* the complainants could not be a competitor for the work, when it so clearly appears that whatever disabilities existed in regard to competition *were produced by the infringers themselves*?"

It is obvious that the gentlemen here referred to were Messrs. Brocklebank, Trainor, Tubbs & Co.

The Act was passed on the 9th of February, 1870. At that time the Nicolson Company had four contracts with the City, and was a bidder for others. The only way to defeat them was to get the charter amended so as to require the property owners to assent. So the Act of February 9, 1870, was procured; and it was followed by the Act incorporating the New Jersey Company on the 17th March, 1870, and then Tubbs' license under the Brocklebank & Trainor patent was assigned to it. Though Tubbs had a contract of the 20th April, 1869, for

paving Grove Street, he was never able to use it under the Brocklebank & Trainor patent, until Dimmock and Westcott, who owned property thereon, received payment of $2,681.50 as a consideration for petitioning that the Tubbs contract might be fulfilled.

Had these facts appeared before Mr. Justice Strong, it is possible that he might not have refused the injunction.

The Defense.

The defenses set up in the Answer are as follows:

1st. That the reissue covers and includes many things not described and claimed in the original Letters Patent.

2nd. Non-infringement.

3rd. Want of novelty, with specifications of twenty-four anticipating patents.

4th. Abandonment, by reason of prior user, for more than two years before applying for Letters Patent, viz., for six years before such time on the Western Avenue of the Boston & Roxbury Mill Corporation, near Beacon Street, Boston (p. 53).

Point I.

IS THE REISSUE DIFFERENT FROM THE ORIGINAL?

The question whether the reissued patent covers and includes that which was not described or claimed in the original patent, was ~~not~~ raised by the defend-

ants in their argument in the Court below, and was ~~not~~ passed upon by that Court; and, therefore, the respondent is without the benefit of a knowledge of the alleged grounds which it may be said support such objection, save as furnished by a distant [illegible] memory.

Argument but the [illegible] was not [illegible] Printed

The question is one of law simply, and can arise but in one way, viz., by a comparison of the specifications of the original and reissued Letters Patent.

The original patent will be found at p. 172, and the second reissue thereof, on which this suit is founded, is printed as Schedule A to the Bill (pp. 8–12).

By consent of counsel (p. 57), this exhibit takes the place of a formal copy of the reissued Letters Patent.

A comparison between the original and the reissued Letters Patent shows that the two are almost identical in their language. The only noticeable change is that of the arrangement of paragraphs, so as to group together more artistically than was done in the original patent, the description of the invention. Every substantial feature of the invention, however, is found in the patent in almost identical language.

The decision of the Commissioner conclusively settles all matters of fact involved in the hearing of the application for the reissue, and the presumption is that the reissue is for the same invention as the original patent was. Whether it is for such invention, the courts have sometimes held, is a question of mixed law and fact; and upon the question of fact no evidence was taken by the defendants (*Bump's Law of Patents*, 178–186).

Point II.

DID THE DEFENDANTS INFRINGE?

This is a question of law, reposing for its decision upon the finding of the previous question of fact: Did the defendants, in the construction of their pavement, employ the process and devices recited and embraced in the first and second claims of the reissued patent? If they did, then the legal judgment of infringement of necessity follows.

In determining the question of fact, the Court below acted precisely as a jury would have acted, had the suit been at law instead of in equity. The question which is always submitted to the jury in an action at law, is the question of fact, of identity between the defendants' process and devices and those embraced in the plaintiff's patent. The decision of the Court below was precisely equivalent to the verdict of a jury. It has found that the defendants employed the processes and devices embraced in the first two claims of the plaintiff's patent. This finding is the legal equivalent of a verdict, and is as conclusive as a verdict would be. It can be rejected only for the same reason, and on the same ground, that a verdict can be set aside on a motion for a new trial, viz., that it was against the weight of evidence.

The defendants in May, 1870, had constructed and were constructing in Grove Street, in the city of Elizabeth, a wooden pavement, composed of a foundation, of rows of blocks with strips between them, and of a concrete filling. The blocks and strips were introduced in evidence (pp. 57, 59) as Exhibits

5 and 6. The record describes (p. 59) the construction of this pavement as follows:

"The pavement consisted:

First.—Of boards laid crosswise of the street, at intervals of twelve or fourteen feet.

Second.—Of a complete flooring of tarred boards laid lengthwise of, and covering the whole road-bed, the ends of these boards resting on the transverse boards just described.

Third.—Of rows of blocks laid crosswise of the street, such blocks having their grain vertical, or nearly so, appearing to have been made by sawing pieces off the plank, and afterwards slightly nicking the same at the lower corners. Exhibit No. 6 is apparently a piece split from one of these blocks, and is a fair sample of their height and width, and of the size of the nicks in the blocks that I saw laid, and being laid. The pavement consisted thirdly of rows of strips, each row arranged crosswise of the street, and between the rows of blocks. These strips were slightly bevelled, Exhibit No. 5 being a fair sample of them.

Fourth.—The pavement consisted, fourthly, of a concrete of gravel and tar—coal-tar, I believe—which was laid on top of the strips, and between the rows of blocks.

The process of laying this pavement was as follows: *First.* The road-bed was prepared and smoothed. *Second.* The longitudinal boards were laid. *Third.* The complete flooring of tarred boards was laid on the road-bed. *Fourth.* A row of blocks was laid upon the boards crosswise of the street. *Fifth.* The strips were laid upon the board floor, shoved slightly under the rebates, if at all, and tacked down with cut nails. Then a second row of blocks was placed against these strips, which served as a guide for the laying of the second row. A second row of strips was then laid, and so on in succession. These strips held the rows in place until the next, *Sixth* step of the process, which was to fill the spaces between the blocks and over the strips with clean, hot or

artificially dried gravel. *Seventh.* The interstices between the particles of gravel were filled with hot coal-tar, and, if I remember right, though I am not positive, the tar and gravel was rammed into the interstices between the blocks, and the whole pavement was covered with a coating of tar and fine gravel. I saw all these parts of the process of laying the pavement going on while I was there."

This was the use of Nicolson's process and of Nicolson's materials, in the manner specified by him. He says (p. 9):

"The earth of a roadway upon which my improved wooden pavement of either plan is to be constructed, must first be suitably graded in any of the usual and well-known methods, in order to prepare it for the reception of such pavement.

I then cover the surface of the roadway, or bed, with tarred paper, or with hydraulic cement laid over it, about two inches in thickness; or with a cheap flooring of boards or plank, which may also be covered with tar on one or both sides, by swabbing or by dipping the boards or planks; or any other preventive to moisture may be used in connection with said foundation or support; the object and effect of such foundation being the support afforded such pavement, and to prevent the absorption of moisture from the ground by the wooden blocks."

This is taken bodily from the original patent, paragraph 6 (p. 173), and paragraph 3 (p. 174).

The claims of the reissued patent which embrace the process and materials, and their union as practiced by the defendants, are as follows (p. 11):

"1. Placing a continuous foundation or support as above described upon the roadway; then arranging thereon a series of blocks, having parallel sides, endwise in rows, so as to leave a continuous narrow groove or channel-way between each row, and then filling said grooves or channel-ways with broken stones, gravel and tar, or other like materials."

This claim, it will be observed, specifies a series of blocks having *parallel* sides.

"2. I claim the formation of a pavement, by laying a foundation directly upon the roadway substantially as described, and then employing two sets of blocks—one a principal set of blocks that shall form the wooden surface of the pavement when completed, and an auxiliary set of blocks on strips of board, which shall form no part of the surface of the pavement, but determine the width of the groove between the principal blocks, and also the filling of said grooves, when so formed, between the principal blocks, with broken stone, gravel and tar, or other like material."

It will be observed that this second claim omits the use of the word "parallel," and, therefore, is not limited to the use of blocks having parallel sides, as specified in the first claim.

The language quoted shows that the defendants constructed a pavement which infringed both of these claims, because it had (*Par.* 1) a continuous foundation upon the roadway; (*Par.* 2) blocks with parallel sides placed lengthwise in rows; (*Par.* 3) strips between the blocks which caused an open groove and determined the width thereof, and supported (*Par.* 4) a concrete filling, which was poured out and rammed into the grooves, and the upper surface of which formed a portion of the pavement.

The construction of such a pavement *prima facie* infringed the first two claims of the plaintiff's patent, which covers as well the process of making such a pavement, as the pavement when constructed.

The burden of proof is upon the defendants to justify their use of these materials in their patented form, and they allege that they have a patent for an improvement, which improvement consists in making

artificially dried gravel. *Seventh.* The interstices between the particles of gravel were filled with hot coal-tar, and, if I remember right, though I am not positive, the tar and gravel was rammed into the interstices between the blocks, and the whole pavement was covered with a coating of tar and fine gravel. I saw all these parts of the process of laying the pavement going on while I was there."

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The burden of proof is upon the defendants to justify their use of these materials in their patented form, and they allege that they have a patent for an improvement, which improvement consists in making

a nick on one or both sides of the vertical parallel-sided block, and in shaping the sides of the strips so as to conform to the nick.

Some stress has been laid upon the fact that the defendants claim under a patent, and it is urged that they are entitled to some sort of protection by reason thereof.

1. The Brocklebank & Trainor patent was not for the invention of Brocklebank & Trainor, nor was it a valid patent. Brocklebank & Trainor were not the inventors of the improvement upon Nicolson's patent, conceding it to be such, described in their patent. It was invented by one Canning. He testified (pp. 110, 111) as follows:

"I laid the first piece that ever was laid of the Brocklebank & Trainor. It was laid in Hartford, Conn., on State street, opposite the Court-house, in the Fall of 1869. I laid it at the suggestion of Mr. Trainor. The first I knew of the pavement was in 1868, when Mr. Trainor and myself were both connected with the Nicolson people, and the first I saw of the invention patented by Mr. Trainor was in 1868, when there was trouble about the strip in the Nicolson pavement coming up. To obviate this trouble, I had made a drawing of the dovetail or rebate, in Mr. Trainor's presence. The first time after this that I ever heard of it, Messrs. Brocklebank & Trainor showed me a patent which I told them was my invention, and have told them so many times since, and they never denied my claim."

This evidence throws a doubt upon the validity of the Brocklebank & Trainor patent, and such doubt cannot be resolved in this collateral action. As long as it exists, however, it impeaches the validity of the patent, and destroys it as a place of refuge for an alleged infringer.

The patent of Brocklebank & Trainor describes

"dovetailed rebates and vertical strips," and "vertical rebates with strips having vertical sides." Of these two forms, Brocklebank says, "Both embody the same principle" (p. 167, x Q. 26). If they do embody the same principle, then Brocklebank & Trainor were not joint, but separate and independent inventors of the same invention.

Brocklebank said (p. 165, 2–8):

"Mr. Trainor said to me one day that he had conceived a way of meeting the difficulty. I told him I thought I also had discovered a mode. He asked me how. I told him to draw out his upon a piece of paper and I would mine, and we would compare them. We drew our separate plans, and found when compared that Mr. Trainor had adopted the square shoulder in the rebated block, and I the dovetailed rebate, both of us using the same transverse plank."

If this is true, Brocklebank & Trainor could not lawfully take out a joint patent for the two forms which embodied the same principle, and were the offspring of two distinct and independent inventors. And therefore, again, the defendants fail to find a refuge under a valid patent.

The patent of Brocklebank & Trainor, and the specification of the defendants' pavement under it, conclusively establish the fact that the change of form in the lower portion of the blocks, by making either a square shoulder or a dovetailed rebate, was not claimed as a new pavement, but only as an improvement of Nicolson's. An improvement of a preceding invention concedes the use of a former invention.

The Brocklebank & Trainor patent says (p. 178):

"This invention relates to improvements in wood pavements, and consists in an improved arrangement of the same, whereby the flooring is strength-

ened, and adapted for the better securing of the vertical blocks to the flooring. A represents the bottom layer of the flooring; B B and D, the upper transverse portions thereof, consisting of strips arranged between the vertical blocks C, and secured to the part A by nailing or otherwise. The spaces between the blocks and above the strips are to be filled with tar, gravel, cement, or other substances, in the usual manner."

The specification (p. 180) for laying the Grove Street pavement required:

"1st. A compound flooring, coated on both sides with a mixture of coal tar and pitch. 2d. A transverse planking or bevelled joist one inch thick, and one and three-quarter inches wide on the top, and bevelled down so as to give one and one-quarter inches on the bottom. 3d. White pine planks three inches thick, and six inches long, and six inches wide, which, before being set, are to be dipped in a mixture of coal tar, and set on end in a line at right angles with the line of the street. 4th. The space between each row of blocks is to be filled with a mixture of coal tar or pitch, and covered with sound gravel and clean sand in equal proportions."

This proves that the defendants employed the four elements of flooring, vertical blocks, strips between the vertical blocks, and spaces between the blocks filled with gravel, tar, cement and other substances—which Nicolson was the first to combine in a wooden pavement — combined as he combined them, and combined for the purpose for which he combined them.

That all or any of these elements were old, is immaterial. If their combination was new, the law authorizes a patent therefor (*Seymour* v. *Osborn*, 11 *Wall.*, 515).

1. The blocks are vertical, and, if so, they are parallel. Brocklebank said (p. 169, 50 x Q.):

"Assuming that the blocks are all of the same

thickness, and that the machine cuts the rebates, as you state, will not the sides of the large blocks above the rebates be parallel? A. They will."

2. The foundation is of boards. The patent says (p. 177):

"*A* represents the bottom layer of the flooring * * * the layer *A* of boards."

3. The strips are called strips *eo nomine* in the patent. It says (p. 177):

"*A* represents the bottom layer of the flooring, and *B B* and *D* the upper transverse portion thereof, consisting of strips. * * * These strips serve to strengthen the layer *A* of boards, * * the edge of the strip *B*. We are aware that strips and short blocks have been interposed between the long blocks *D C* to fill up the spaces, and on to which the gravel and other substances have been packed. * * By our arrangements * * the blocks also rest partly on the cross-strips. * * It will be understood that the spaces between the blocks and above the strips," etc.

In the depositions of the defendants there was a studied effort to drop the use of the word "strip," and to adopt in its place, for the purpose of misleading, the high-sounding phrase "transverse planking," *i. e.* what the patent calls "strips arranged between the vertical blocks." The functions of these strips were to insure the parallelism of the large blocks, to space the distance between them, and to afford a support for the filling.

Brocklebank said (p. 169):

"47 x Q. Does not your strip, as well as that of Mr. Trainor, insure, when the blocks are properly placed against the strips, a parallelism or uniformity in the transverse channels? A. When the blocks are placed on the strip or transverse planking, they have the same uniformity.

"48 x Q. Does not the upper surface of Mr. Trainor's strip, and also in yours, support the concrete with which the transverse channels are filled? A. They do."

Miller, a witness for the defendants, who testified that he knew the Brocklebank & Trainor pavement, was asked as follows (p. 152):

"Do you know the Brocklebank & Trainor pavement? A. I do.

"Does not the strip in that pavement cause and define the width of the channel between the blocks? A. It does.

"Does not the strip also afford a support or foundation for the concrete with which the channels are filled? A. The concrete rests upon the strips."

This is precisely the Nicolson pavement. His process was pursued, and his materials were used as he used them in laying the pavement of the defendants on Grove Street, and thereby they infringed the first and second claims of the complainant's patent.

Even if the defendants had a valid patent, and such patent was an improvement on that of Nicolson, such subsequent patent for the improvement would give no right to use the original invention. Or, as is said in *Bump's Law of Patents* (p. 212), "An improvement will not justify the use of a prior patent, without the consent of the first patentee."

But did the defendants improve the Nicolson pavement?

They claim that they have cut a nick either square or dove-tailed along the sides of the larger blocks, and have caused their strip to fit into this nick, and thereby have disseminated the weight of a passing vehicle over a larger portion of the foundation surface.

This would seem to be illusory. The changes made are dignified in the evidence by the title of "dove-tailed rebate," and the strip is advanced in phraseology to the high-sounding name of "transverse planking."

The patent under which the defendants claim states (p. 179) as follows:

"According to our plan, * * * we arrange the dove-tailed rebates on one side of the vertical blocks, * * *the other side being straight, and resting against the straight side of the strip."

Here all attempt at exalted phraseology is abandoned, and things are called by their right names. So that there are blocks with plain sides; that is, parallel sides; and strips with plain sides.

So far, therefore, the improvement must be conceded.

Does the fact that the dove-tailed rebate is cut on one or both sides of the larger block destroy its identity? Most clearly not; for the parallelism of the large block above the cut still remains, and that is all there ever is above the strip.

But this dove-tailing is said to add a new function to the block; and that is, that it holds down the strip, and distributes the load of the weight above. This is also illusory, for—

1. The road-bed was required by the specification to be rounded so as to afford proper drainage. The language is (p. 180):

"Care must be taken in excavating to preserve the proper crown, and so as to cause an easy and smooth crown to the street."

Such a crown implies a curvature; and, as matter of fact, the road-bed in Grove Street was rounded (p.

59). It was rounded by being highest at or near the centre of the street, conforming in curve to that of the prepared road-bed, as is usually the case in all pavements.

2. The strips are thin and flexible. They may be made to assume a curvilinear position. How, then, are they to be made to retain it? The patent answers this (p. 179):

"When the strip is nailed or otherwise fastened down."

3. The blocks are rigid, and cannot conform to the curve of the street, and, therefore, as a matter of mechanical fact, they ought to be tangent to the strips below, and not to rest at full length upon them. This is provided for in the patent, which says (p. 179):

"These strips frequently fail of being brought down close to the bottom layer of the floor, owing to the curvature of the bed of the street. By our arrangement the ends of the blocks are brought to one exact and uniform thickness by rebating, whereby they may be packed tightly together, *and the blocks also rest partly on the cross strips.*"

At the time the testimony in this suit was taken, the infringing pavement was not laid a sufficient length of time to develop the result of the breakage of the nails, which do break; for, as was said in the patent (p. 179):

"When the filling is rammed down the nails are broken, and the strips separated from the block."

As is stated in the record (p. 111):

"Ramming the gravel, or driving in the concrete, in a great many cases, causes the nails to break."

The obvious result of this would be a tendency on the part of the strips to resume their natural position of a straight line, and, in so doing, if they caught on the upper blocks, to throw them up. If they did not catch, then the tendency of the strips would be, as the defendants claim it is in the Nicolson pavement, to work up. This allegation of defectiveness in this regard of the Nicolson pavement is not well founded, for it appears that instead of the strips working up, the block wears down to the strip. The evidence upon this point was (p. 101):

"At the request of the counsel for the complainant, on Thursday last I walked about half the length of the Mercer Street pavement. In going the first two blocks from Canal Street I saw seven strips appearing on the surface, noticing that the portion which appeared was short, and always near the middle of the street, where the travel was the greatest. A few blocks above, and also near the centre of the street, I saw several strips appearing in a very short distance. I noticed that the pavement there appeared much worn, as if it had been undermined by water. I then, after a further careful examination, believed it probable that these strips appeared on the surface, not because the strips had risen up, but because the blocks had actually worn down to the top of the strips. On going further up the street, I found a place where the pavement was taken up for a length of about 30 feet, and half-way across the street; strips appeared near the centre of the street in that part of the pavement which was left, and I could see on the line where the pavement was taken up, that these strips thus appearing were all down in their places, and that the blocks had actually worn off more than three inches, thus exposing the strips near the middle of the street, where the travel was greatest."

4. The Brocklebank & Trainor Patent states (p. 179):

"So that in case of any soft place under the flooring, the blocks immediately above it will not settle down so abruptly; their weight and that of the load they have to sustain being suspended over a greater surface by the said arrangement of blocks and strips."

Experience had not demonstrated, when the evidence in this suit was taken, the truth of this alleged result that the blocks will not settle down; but if it had, there is nothing of novelty in the means requisite to prevent it. In the Nicolson Patent this was provided for (p. 10) as follows:

"In order to prevent the blocks from being forced below one another, in some of my modes of constructing the pavement they may be pinned together with wooden pins extending from block to block."

The projection of the strips in the Brocklebank & Trainor pavement under the nick cut in the side, is but the mechanical equivalent for this dowel-pin of Nicolson. The only difference between the two is that the strips, instead of being cut into the shape of pins, run across the street without interruption. But their effect, so far as preventing the blocks from sinking is concerned, is precisely the effect produced by Nicolson's pins.

5. The claim of greater distribution of the weight of the load is not supported by the evidence, but rests upon assertion only. That assertion is disproved by the logic of the facts. Science as yet knows of no means whereby the distribution of the weight over the planking could be actually measured. The evidence (p. 101) is as follows:

"I know of no means whereby the distribu-

tion of the weight over the planking could be actually measured. In the pavement, as I saw it laid, the blocks were often warped. The rebate in them was irregularly cut, as appears by Defendants' Exhibit 3, and the nick is of small depth, averaging considerably smaller in the blocks I saw being laid than in this exhibit. I should say that the block which I now produce, marked "Grove Street," is a fair sample of the size and character of the nicks in the blocks which I saw being laid. These blocks are, moreover, cut very roughly from the plank, and the strips were sawn out of common, rough, unplaned boards, it being well known that such boards vary much in thickness in their length. Now, by applying the piece marked Complainant's Exhibit No. 7 to either of these blocks, it will be seen that the nicks are very much out of true, and that even a plain strip does not apply itself accurately to them. This discrepancy in fit would be much more apparent if the strips were made, as is the practice, from rough boards. It is evident that the weight pressing upon any one block cannot be borne both upon the plank and below it, and the strips on each side of it, unless the pavement is so accurately constructed that the block bears equally hard both upon the planking below and upon the strips upon each side of it. This, so far as my observation of the pavement extends, is never the case in the pavement as actually laid, and never can be the case, unless the pavement is made as accurately as cabinet work. In practice the blocks either rest upon the two strips on each side of it, or upon the planking below it, without bearing any weight upon the two strips, or cockles over, resting partly upon the planking and partly upon one strip. The base afforded by two strips is not quite so wide as the bottom of the block, and the surface of the bottom of the block being cut away by the rebate is not as large as that of the Nicolson block. The blocks, therefore, in the practical Brocklebank and Trainer pavement, distribute the weight over a less surface than is done by the blocks of Nicolson. Exhibit Y is a carefully prepared block, prepared much more carefully than those

commonly used. Exhibit S 2 is a piece of carefully prepared strip. By applying the two sides of these exhibits, which are marked with the cross and a circle, together, it will be seen that even this carefully prepared block and strip are not such as would distribute the weight over the block and the two adjoining strips. On the contrary, the weight would be borne by the strips only."

"Q. 26 (*bis*—p. 108). Assuming two pavements, constructed in accordance with the Nicolson and the Brocklebank & Trainor pavement, having a foundation of board laid upon string-pieces, is there anything in the form of the strip in the Brocklebank & Trainor pavement which causes the weight of the passing load to be distributed over more surface beneath the blocks than it would be distributed if the same load were passing over the Nicolson pavement? A. I do not think it would. I have viewed that point and examined it thoroughly. The blocks and strips, both resting on a board within the space of four inches, can make no difference in the pressure from the top on a board lying at the bottom. For instance, in the space of six inches it is impossible to make any curvature on a continuous foundation of that kind.

"Q. Which can be drawn the more easily over sand, a broad or a narrow tired wagon? A. A broad tired wagon over sand.

"Q. Is that because the broad tire distributes the weight over a greater surface of the road? A. Yes, sir.

"Q. Is there any such advantage from the use of the broad or narrow tires if the surface of the road, or that upon which the carriage is to pass, is formed of boards properly secured? A. No, sir; there is no advantage.

"Q. Assuming a section of Brocklebank & Trainor pavement to be built across the road—is there any way known to you, as a constructor of wooden pavements, by which you could determine that the weight of a passing load, when it reached a floor foundation, was distributed over a larger space than it would be if the same load was passing over a Nicolson pavement? A. None whatever."

It is not true, therefore, as matter of fact, that any benefit results from the nicked and dove-tailed strips adopted in the infringing pavement. It is not true, as matter of fact, that the weight of the passing load is distributed over a larger portion of the plank foundation below. That such distribution is made rests upon assertion only. There is no device known to science or mechanics by which the truth of the assertion can be tested. An ordinary wagon-wheel is tangent to the road, but only on a very small portion of its circumference. It is impossible to say that the pressure at such circumferential point is, by reason of the nicks and rebates in the blocks and strips, spread out in the shape of a Λ upon a larger portion of the wooden surface below.

It is evident, therefore, that the Brocklebank & Trainor pavement is not, as matter of fact (whatever might have been the theory and intent of the pretended inventors), an improvement upon the Nicolson pavement. Therefore, the defendants can find no shelter under the suggestion that they have made an improvement, in the enjoyment of which they are entitled to be protected. But even if such improvement had been made, it would not justify the use of the prior Nicolson patent.

VII.

WANT OF PARALLELISM.

It is claimed that when a vertical block six inches high has cut on its lower edge a dove-tailed rebate, three-eighths of one inch at the top, one inch in

height and one-eighth of an inch at the bottom, as shown in the models and specification, the block ceases to be parallel, and therefore is not the Nicolson block.

1. As has been shown (p. 169), Brocklebank himself testified as follows:

"50 x Q. Assuming that the blocks are all of the same thickness, and that the machine cuts the rebates as you state, will not the sides of the large blocks above the rebates be parallel? A. They will.

"47 x Q. Does not your strip, as well as that of Mr. Trainor, ensure, when the blocks are properly placed against the strips, a parallelism or uniformity in the transverse channels? A. When the blocks are placed on the strips or transverse planking, they have the same uniformity."

The strip to be used in this nick, as has already been shown, is the Nicolson strip. Brocklebank was asked (p. 168, x Q. 33), what was the difference between his strips and that of Nicolson, and he answered:

"The only difference is, that the Brocklebank & Trainor strips have more timber in them than the Nicolson, and are much longer."

2. In view of the first claim of Nicolson's patent, the fact that the large blocks have a nick on one or both of the lower edges, is immaterial. The blocks have continuous foundations, they are arranged thereon endwise in rows, which rows when formed have parallel sides, and the continuous grooves between them are filled with concrete. This embraces every element of the first claim in the Nicolson patent.

3. The pavement, as laid on Grove Street, infringed the second claim, because it employed a set of blocks, and strips of board which formed no part of the surface of the pavement but determined the width of the groove between the principal blocks, and because, also, the said groove, so formed, was filled with stone, gravel, or tar. This claim, therefore, is infringed by the Grove Street pavement, whether the sides of the larger blocks are or are not parallel.

4. But the portion of the principal block cut off by the defendants is not thrown away. In theory, and substantially in fact, such piece is added on to the side of Nicolson's straight strips to make it beveled, so that it will fit more or less accurately the rebate. The particles of wood are, in the first place, simply shifted in position; that is, they are taken away from the side of the block and added to the side of the strip, and then, in the second place, they are restored to their original position. What the block loses in width by the rebate, the strip gains in width in order to fill up the rebate. And this gain is theoretically by the addition to the side of the strip of the portion cut from the large block. When this is done the parallelism of the blocks is restored within the first and second claims of Nicolson's patent. The momentary separation of the parts does not destroy the ultimate parallelism of the blocks, or in any manner change or modify the fact of original parallelism.

5. Again: The patent of Brocklebank & Trainor provides that this change of the particles of wood from the bottom of the block to the side of the

strips may be omitted on one side of every block and strip. Such an omission, while it concedes a *pro tanto* identity with Nicolson, is claimed in the patent as the same thing with the double rebates and bevels. If one-half of the whole of the defendants' blocks and strips is equal to the blocks and strips of Nicolson, and such whole is, as the patent claims, equal to one-half, then the whole is equal to Nicolson's.

6. The reason why Brocklebank undertook to evade the Nicolson patent by this so-called "improvement," will probably be found in his answers to Q. 4 and Q. 14 (pp. 165, 166):

"I was interested in the Nicolson pavement from its first introduction into this city (*i. e.*, New York), until March, 1869. * * * I was to have had an interest, but got chiseled out of it."

And such chiseling resulted in producing a nick on one side of the Nicolson larger block.

VII.

Want of Novelty.

The third Defense set up in the answer is "want of novelty." The evidence as to this is all documentary, and is afforded by a large number of English and French patents. As only one such patent (Hediard's) has been printed in the record as it now exists, it is not known whether the defendants intend to rely upon the same or any thereof, as supporting the defense of the alleged want of novelty.

If reliance, however, be placed upon these various foreign patents, then it is proper, in the first place, to refer briefly to the law declaring what a foreign patent must contain in order to defeat a subsequent American patent. The law upon this point is grouped together in *Bump's Law of Patents* (p. 319) as follows:

"The description in a foreign publication, in order to invalidate a patent, must contain and exhibit a substantial representation of the patented improvements, in such full, clear, and exact terms as to enable any person skilled in the art or science to which it appertains to make, construct, and practice the invention to the same practical extent as they would be enabled to do if the information were derived from a prior patent."

Foreign patents stand upon the same footing precisely as foreign publications (*Webb* v. *Quintard*, 9 *Blatchford C. C. R.* 352).

The law in England is the same. In *Betts* v. *Neilson (Eng. Law Rep.*, 3 *Ch. App.*, 435) Lord Chelmsford said:

"The prior publication should contain all the minuteness of detail of specification, so that a workman by following it, might produce the thing subsequently patented."

In *Hill* v. *Evans* (8 *Jur., N. S.*, 529) the Lord Chancellor said:

"The antecedent statement must be such that a person of ordinary knowledge of the subject would at once perceive, understand, and be able practically to apply the discovery without the necessity of making further experiment and gaining further information before the invention can be made useful. As to the alleged information given by the prior publication, it must, for the purpose of practicability, be equal to that given by the subsequent patent. If specific details are necessary for the practical work-

ing or the real utility of the alleged invention, they must be found substantially in the prior publication."

No one of the patents offered in evidence by the defendants affords the information required by this rule, save that of John Hosking, of September 6, 1849, that is of March, 1850. In other words, no one of these patents, taken separately and by itself, gives information which would enable a person skilled in the art of constructing wooden pavements, and seeking to reproduce the pavement described in Nicolson's patent, to make a pavement containing the four elements described by Nicolson, combined in the manner in which he combined and claimed them.

Moreover, no one of these foreign patents appears to have been put into successful, practical use. Mr. Stafford said (p. 104):

"I am the inventor of what is known as the Stafford pavement, which is a wooden pavement that has been extensively used in New York and elsewhere. I am familiar with wooden pavements, and have given them a great deal of study. I have taken out some six patents therefor myself. * * * I never heard of any wooden pavement constructed in accordance with an English or French patent, being successfully laid in this country. I know the Nicolson pavement. It is the oldest successful wooden pavement with which I am acquainted. It has been followed by others, including my own. None of such other pavements have had any general practical use until within the last four or five years."

Waterbury said (p. 106):

"Wood pavement was laid down in Nassau Street, New York, in 1845–6. It was a failure. It was represented that they were made after some English patent. It laid but a year or two, and then was taken away. A piece was laid in front of the

new Treasury Building in Nassau Street, but it was only kept there for a year. Q. How many kinds of wooden pavement have come under your supervision or study? A. Some fifteen or more. Q. How many of these have been practically successful in the streets of cities? A. When wood pavements were first laid they were approved, and then they fell into disrepute, and there was a prejudice against them. Q. When after that were they again practically introduced? A. When the Nicolson pavement was first introduced as a specimen in New York. This was in 1865 or 1866. Q. Where? A. In Nassau Street, in Water Street, and in Hanover Street. Those pavements are there yet."

Canning (p. 110) said:

"Q. With what kinds of wooden pavement have you had any practical experience? A. With the Nicolson. I laid, I believe, the first piece that ever was laid of the Brocklebank & Trainor; the Stowe pavement also. Q. How much of the Nicolson pavement have you ever seen laid, and where? A. I have seen miles of it. I have seen most all that was laid in Chicago up to four years ago. I have seen it in New York and in Philadelphia, Brooklyn, and Elizabeth, New Jersey. Q. How lately has there been introduced into successful practical use any other form of wood pavement than the Nicolson? A. In the last two years I have seen the Brocklebank & Trainor, the Stowe, the Stafford, and on one avenue in Boston nine or ten different kinds."

Brocklebank (p. 190) said:

"I consider the durability of said Nicolson pavement greater than that of any other, from the fact that each block of wood has an equal foundation, and its worth is at least 100 per cent. more than any other pavement now in use. Considering all its merits and value, it is the best pavement that was ever introduced to the public, and is worth at least 200 per cent. more."

Trainor (p. 191) said:

"I have known the Nicolson pavement since 1859.

I laid six thousand yards of the same in Milwaukee in 1861; was engaged in laying it in Madison, Wisconsin, in the years 1865 and 1866; laid ten thousand yards in Oshkosh, Wisconsin, in the year 1866; laid nine thousand yards in Green Bay, Wisconsin, in the year 1867; I superintended laying it in Philadelphia and New York cities, twenty thousand yards. * * * I consider the Nicolson pavement, all things considered, the best that has ever been introduced to the public, and worth at least 150 per cent. more than any other known pavement. I know that wherever the pavement has been laid it is rapidly gaining favor and greatly superseding all other forms or kinds of pavement; and I know that where they have had it the longest and have got the most of it, the greater it is in demand."

It appears, therefore, that there was no successful user of any wooden pavement in this country prior to the invention of Nicolson. It does not appear that any one of the English or French patents was ever put into actual practical operation. It does not appear, therefore, that such foreign inventions were useful in that sense which the law requires, namely, of enabling the patentee to accomplish the desired result of a successful practical wooden pavement. If they were not useful in this regard, then they were not such inventions as will defeat the Nicolson patent, which is proved to be of great and steadily increasing value.

Even if this were not so, the combination of elements, and the process of utilizing them described in the first two claims of Nicolson's patent, are not to be found in any one of these foreign patents.

1. The first patent referred to is that of *David Stead*, of May 19, 1838. This specifies vertical blocks, which may be triangular or otherwise, boiled in tar, pinned together in rows diagonally across the

street, with their opposite sides nearly parallel, and on a road-bed prepared in as solid a condition as possible. The interstices to be filled with pitch or tar or sand (pp. 129, 137, Q. 10).

This does not anticipate Nicolson, for it does not describe, (1) a plank or equivalent foundation, to prevent moisture; (2) long and short blocks; (3) strips; (4) transverse channels or squares, filled with sand or tar. Or, as Mr. Renwick stated (p. 91):

"It has not the least resemblance to the pavement of Nicolson, except in the fact that it is made of wooden blocks set on end."

2. The second patent is that of *John Brown*, of November 8, 1838. This patent describes (p. 129) blocks upon strips of angle-iron resting upon the roadway; which blocks may be either stone or wood, and laid across the street so as to form interstices between the ends of the blocks, which are to be filled with sand or tar. The iron strips project beneath the blocks and support them, and are formed together in sections. These "angle-irons" are, in fact, metallic frames, provided with sides and ends and cross-bars, forming a sort of trough or gutter, open at the bottom, in which the blocks are to be placed. The patent does not suggest wooden frames, which would be too frail. The blocks tilt, and the interstices are not deep enough to retain the sand, tar or gravel.

This does not anticipate Nicolson's invention, for it does not (pp. 91, 92) describe (1) a foundation; (2) long and short blocks; (3) strips between the blocks, determining their parallelism, and sunken so far as to retain and support the concrete between the blocks, thus constituting a portion of the pavement

itself; or (4) transverse channels between the blocks across the street.

3. The third patent is that of *Thomas Parkin*, of 1839. This describes (p. 130) blocks of any figure, upon a foundation of sand, ashes or sawdust, saturated with tar or bituminous substance, especially if boiled, laid upon the natural ground for the blocks to rest on, and having channels made between the blocks by chamfering off the outer edges. The chamfering makes the blocks partially V-shaped, and they are therefore to be placed on their larger ends, like so many Λ's, and the groove so formed run across the street and parallel with it. This form has been patented in the United States (p. 151).

This invention does not anticipate Nicolson, for it does not describe (1) a foundation which would be practically useful to support the blocks; (2) long and short blocks; (3) strips; (4) transverse channels, which would hold the concrete against the action of the horses' shoes (pp. 91, 92). Burtis, who testified for the defendants (p. 151) as to this V-shaped pavement, calls it "an improvement" on the Nicolson pavement, dispensing with the strip, and says that "the Miller Pavement Company got a right to use it from a patent to Alexander Miller."

4. The fourth patent is that of *William Grimman*, of 1840. The defendants state (p. 130) that this "differs in the mode of the arrangement of the blocks from either of the Nicolson pavements." This patent in fact does not describe any long and short blocks, or strips, or blocks laid in rows. On the contrary, the blocks are laid herring-bone fashion, like a brick sidewalk, and are so shaped that they

cannot be placed vertically, but must be set at an angle to be vertical, so that each block shall be partly supported by its neighbors. The drawing shows a mere shallow hollow groove cut in the top of the block. If the blocks be of the ordinary depth, these grooves would not be half an inch in depth, and would be perfectly useless for the purpose of holding tar or concrete. The letter-press does not refer to these grooves; and there is not even a hint that they are to be filled with any material whatever (p. 92).

This does not anticipate Nicolson's invention, for it does not describe (1) large and small blocks, (2) strips, or (3) transverse channels with concrete filling.

5. The fifth patent is that of *David Stead*, of 1849. Of this two models were produced (p. 134), Nos. 26 and 27. These models are inaccurate, and are not warranted by the specifications and drawings, for they exhibited grooves in one direction only. The pavement shown by model No. 26 would be impracticable, for the reason that the wheel would cut out the cement from the grooves, which run lengthwise of the street, and would thus fill the pavement with ruts.

This patent does not anticipate Nicolson's invention, for it describes—(1) "A road-bed prepared by any of the well known means," which is not a foundation as contradistinguished from the road-bed, and which is not, therefore such a "foundation" as Nicolson describes and requires. A "road-bed prepared by any of the well known means," is not a "foundation," as distinguished from itself, and would not of itself be impervious to moistnre. (2) The use of asphalt or cement, which is not the "con-

crete" of Nicolson. (3) The placing of the blocks one over the other, so that one upper block lies upon portions of three blocks below (figures 10, 11, 12, 13), is not such a "foundation" as Nicolson describes. Figures 22 and 23 show a pavement having neither "foundation" or "concrete" nor "filling" up to the surface of the pavement, but requiring the upper ends of the blocks to project above the filling, so as to give a foothold to the horses, thus substituting (figure 20) the ridges of the planks for the concrete, to prevent slipping.

This patent, therefore, does not show (1) long and short blocks; (2) strips; (3) transverse channels filled with concrete, separated by short blocks or strips protecting the horses from slipping; or (4) any such foundation as that described by Nicolson, or any that could be fairly called an equivalent therefor; nor (5) any such combination of blocks and strips, filling and foundation, as is described and claimed by Nicolson.

6. The sixth patent is that of *Thomas Wood*, of 1840. Of this the defendants say (p. 127) that it does not describe any special foundation as the foundation to which the pavement is to be applied. This patent describes long and short blocks, with a filling, but it does not describe (1) continuous transverse grooves across the street; (2) any foundation which is included by the description, which requires the taller blocks to be "rammed down" for the purpose of wedging the blocks. This shows that the road-bed is to be a yielding one, capable of conforming to the underside of the pavement, as the sand-bed does to the underside of cobblestones. If there were any hard foundation, such as Nicolson

describes, combined for the purposes he claims, such foundation would prevent the ramming down of the taller blocks. (3). There are no strips or any equivalent thereof. The blocks described are sections or pyramids, laid with the small sections and large sections alternately uppermost, each large section resting upon the sloping sides of four adjacent smaller sections, and such latter resting upon the ground. It is obvious that if these large sections are rammed down to their full extent, the top of their surface would be upon the same plane as the top of the surface of the other blocks, and therefore the patent does not describe any long or short blocks which remain such after the ramming is fully completed. These inverted pyramidal blocks, supported on the sloping sides of the adjoining four pyramidal blocks, are not equivalents either for the strip or for the long and short square blocks of Nicolson. Besides, it is apparent that this pavement would be utterly useless, because the pressure would cause the smaller blocks to sink into the road-bed, where the water would collect, and the pavement would, therefore, become useless.

This pavement differs from Nicolson's (1) in the elements actually used; (2) in the absence of a foundation, and of any proper equivalent for the strip or short block; (3) in the absence of the four things combined by Nicolson; (4) in the mode of the combination, that is, the process of its construction.

7. The seventh pavement is that of *Henry Pinkus*, of 1840. This, the defendants claim (p. 131), describes cubical wooden blocks, laid across the street in rows, close together, and keyed together by strips which fit in grooves in the sides of the block; cells

are made in this pavement disposed in a chequered manner and filled with a composition of asphaltum, gravel and sand, differing from the Nicolson's caveat and patents only by being formed in the blocks by boring a circular hole in the middle of the block, instead of by the use of long and short blocks.

This patent really describes (p. 93) a pavement made by uniting a number of blocks together by means of rods, these rods lying in grooves cut horizontally in the blocks at a point about half-way between the tops and bottoms of the blocks. There are to be two sets of rods, crossing each other at right angles, the blocks by means of the rods being "thus formed into textile or woven masses." These masses, forming squares composed of many blocks, are then to be laid down upon buttresses of wood or brick, which are imbedded in stone or concrete foundation. The blocks are to have large holes bored in their upper surfaces, which are to be filled with asphaltum or gravel.

This does not anticipate Nicolson, because the patent does not describe (1) long and short blocks; (2) blocks or strips; (3) a combination of long and short blocks, or blocks and strips, with concrete filling, in transverse channels across the road.

8. The eighth patent is that of *de Calcina*, of 1841. This, the defendants say (p. 131), describes blocks which differ from the Nicolson blocks in being rebated at the bottom so as to project down between horizontal supports or sleepers of wood, upon which they are laid.

Bearing in mind the claim that the Brocklebank and Trainor large blocks are rebated, and that such rebates repose upon what is called the transverse

planking which fits into the rebates, and thus supports the larger blocks, it follows that Brocklebank and Trainor's blocks, rebated at the bottom, project down between the horizontal transverse planking or supports upon which they are laid, in the precise manner in which the blocks are rebated and supported, and project down in this English patent of de Calcina. Therefore there was no novelty in the alleged improvement of Brocklebank and Trainor.

This de Calcina patent does not anticipate Nicolson, because (1) all the blocks are of the same length; (2) there is no foundation; (3) there is no concrete filling; (4) there are no transverse channels made by the use of strips or short blocks; and (5) no such combination of elements as that described and claimed by Nicolson.

9. The ninth patent is that of *John Perring*. This describes (p. 94) blocks of wood so formed that when the pavement is made the grain does not stand vertically. The rows, separated by strips which are held in place by means of pins driven through the strips into the blocks on each side of the strips, and hold the bottoms of the strips as far above the foundation as the tops of the strips are below the surface of the pavement—a position in which it would be impossible to retain the strips, and which would render it equally impossible to ram the interval between the blocks with tar or concrete. Nor, in fact, is there any direction in the patent that the grooves should be filled with tar, or concrete, or any other material, as is required in the Nicolson patent. The strips do not rest upon the roadway, but upon pegs, leaving, in fact, covered gutters across the street between each row of blocks, which, if the

foundation were water-tight, would contain water and sand, which would spurt up as the pavement was driven over, as sometimes occurs when walking over an ordinary brick pavement.

This patent does not anticipate Nicolson's, because (1) it has no vertical long and short blocks or their equivalent; (2) no concrete filling; (3) the strips are used in the middle of the blocks to keep the blocks apart, so that the calks of the horse's shoe may catch in the openings and thus give the horses a foothold; (4) the strips do not, and will not support, and are not intended to support, so much of the surface of the pavement as is formed by the concrete filling. They answer no part of the purpose of Nicolson's strips save that of keeping the blocks apart. They do not rest upon the bottom, and therefore there is nothing to prevent the blocks from being moved upon the centre-pins. Nicolson's short blocks and strips with the rammed concrete keep the large blocks rigidly straight. The strips are not in the same position, nor do they perform the same functions as in Nicolson's and the defendants' pavements. (5) No foundation is described as an essential part of the combination. The language is, "*When* the blocks are to be laid upon the concrete or other artificial substrata in a place where the traffic is considerable," &c. The exclusion of water from between the blocks and from under the surface of the blocks is not provided for. (6) With Perring's description, a mechanic could not construct either Nicolson's pavement or the defendants'; nor (7) could he, if he kept the strips in position, prevent the water from coming up and going down, and thus rendering the pavement practically worthless; (8) there is no combination in this patent of Nicolson's foundation, and long and short blocks, or their

equivalents, and concrete filling. Nor is there any claim for these elements separately or in combination.

10. The tenth patent is that of *Osborn Reynolds*, of 1842. Of this the defendants' witness says (p. 132): "I do not understand that this patent describes channels or cells formed between the blocks by the use of short blocks, and it therefore differs from the Nicolson caveat and patents. This patent in fact describes a plank road, with planks running lengthwise, and, lying thereon, the blocks having no particular shape and with no filling in their interstices."

Both parties admit that this differs from Nicolson's invention in that it has (1) no long and short blocks; (2) no strips; (3) no similar foundation; (4) no transverse channels; (5) no concrete filling.

11. The eleventh patent is that of *Moses Poole*, of 1842 (p. 132). Of this patent the defendants state that it is formed of blocks of wood, set in rows across the street, rebated so as to fit upon the strips, and supported upon the strips by plank laid upon the road-bed, being a further anticipation of the rebate and strips claimed as new by Brocklebank & Trainor.

This patent does not anticipate Nicolson, for it does not have either (1) long and short blocks; (2) strips; (3) transverse channels or cells; (4) concrete filling; or (5) solid foundation (p. 95).

12. The twelfth patent is that of *Frederick Harlowe*, of 1843. It is conceded (pp. 132–95) that this pavement does not describe (1) either long or short

blocks; (2) strips; (3) transverse channels or cells; (4) concrete filling; or (5) foundation.

13. The thirteenth patent is that of *Henry Austin*, of 1843. This pavement (p. 95) is composed of slabs glued or fastened together like a table-top, with strengthening battens underneath, which are fastened to sleepers laid on the roadway. These slabs when so fastened are called compartments, and they are to have blocks of wood glued upon them. No arrangement is shown for placing these blocks in rows, nor is it stated that the spaces between the rows of blocks are to run across the street.

This patent does not anticipate Nicolson, because (1) it has no long and short blocks; (2) no strips or their equivalent to facilitate the construction or complete the combination; (3) no waterproof foundation, the only foundation being sleepers, affording at intervals a local support to the compartments; (4) the blocks are not supported, save by glue or its equivalent, so that the concrete cannot be rammed between them; (5) nothing determines the width of the channel; (6) nothing suggests that the channels are to be transverse; (7) there is no combination or foundation of long and short blocks and strips with cells or transverse channels and concrete filling, such as is described and claimed by Nicolson.

14. The fourteenth patent is that to *Crannis and Kemp*, of 1843, of which what were called models (Exhibits 34, 35, 36, 37) were introduced in evidence (p. 134). Model No. 35 was said to have been made from the drawing (figure 42), and the model shows continuous grooves straight across the street. Such

grooves are not shown by the patent or drawing, figures 19, 41, 42. The patent in lines 26 to 32 (p. 5) says that the blocks are to be "laid alternately in rows, with the hollow spaces produced by those with curved surfaces, placed opposite the solid of the other block." The model shows the hollow spaces placed opposite each other, so as to form a continuous groove, which is in direct violation of the language of the patent, which expressly breaks up the groove by placing in front a solid block, and so destroys the continuity of the groove (p. 96).

This patent does not anticipate Nicolson, because (1) it has no long and short blocks or strips, or their equivalents. It has blocks, some of which are cut on their lower face so as to produce a curved surface or hollow, such as might be made by running the carpenter's tool known as the gouge through the top of the block. But this cutting of the groove, even if the instrument by which it was cut was of the full width of the block, does not imply shortening the block in the sense of Nicolson's patent. Blocks may be grooved in alternate rows, and yet the blocks themselves may be, and, so far as the present patent is concerned, are of the same height. (2) There are no such transverse channels, with checkered depressions, such as Nicolson describes. The grooved spaces are made to catch the horses' feet by catching the calks so as to prevent slipping. (3) There is no suggestion in the patent that these grooves or hollow spaces are to be filled with concrete, as in the defendants' and in Nicolson's pavements. Either pavement would be useless without the filling. The filling would be useless in the Crannis and Kemp pavement,

because it would not act as such, there being nothing to retain it, and, if it were poured on it, would act as a plaster simply. (4) The pavement is nothing more than a continuous wooden block pavement, with a portion of the blocks grooved. (5) There is no arrangement of long and short blocks, as Nicolson describes them, and no arrangement of long blocks and strips, and no transverse channels between the same, the width of which is determined by the strip, and no cells or channels which are filled with concrete. (6) The patent does not contain the combination of Nicolson, because it does not combine long and short blocks or strips with the concrete filling in continuous grooves; nor does it combine what it does describe with any such foundation as that to be found in the Nicolson and in the defendants' pavements.

15. The fifteenth patent is that of *Fountaine Morceau*, of 1848. The description given in this patent is so obscure as to leave it difficult to state precisely what it does describe. So far as it can be understood, it is a description of a wooden pavement laid on a sand foundation, and this pavement is to be covered with a thin asphalt pavement, which is combined with the wooden pavement below it by means of pegs driven into all the blocks, some of which may be long and some of which may be short. Or, if the blocks are not used, dove-tailed grooves are to be cut in the sides of the long blocks which surround the short ones, so that the layers of asphalt may be prevented from moving.

This patent does not anticipate Nicolson, because: (1.) It has no such foundation as Nicolson describes. (2.) It does not describe blocks with strips running

crosswise, and having cells or transverse channels between them filled with concrete. (3.) It does not describe or claim any combination of foundation, long and short blocks, or strips, with cells or transverse channels filled with concrete. It describes only a sand foundation and wooden blocks, connected together by pins, with a covering of asphaltum formed over the blocks.

16. The sixteenth patent is that of *Richard Love*, of 1846. It is claimed by the defendants (p. 133) that there is no substantial difference between the pavement described in this patent and that described in the Nicolson.

This patent does not anticipate Nicolson, because: (1.) It uses no wooden blocks of any kind. It uses wooden wedges to hold the stones firmly in position. These wedges are not stated, nor do the drawings show them to be driven below the edges of the stone, so as to form transverse channels. (2.) There are no transverse channels. (3.) There is no concrete filling. (4.) There is no such foundation as Nicolson describes. (5.) There are no long or short blocks or strips, or their equivalents. Nor (6) is there any description or claim of any element of Nicolson's combination.

17. The seventeenth patent is that of *Alexander Hediard*. It is set out in French (pp. 183 to 188), and what purports to be English translations thereof are also set out (pp. 327 to 332).

The petition of appeal in this case was filed on the 30th November, 1874 (p. 319), and the defendants were given until the 12th December, 1874, to perfect their appeal (p. 318). Copies of the petition

of appeal, of the appeal bond, and of the citation, were duly served upon the 30th November, 1874, and thereby the appeal was perfected. In September, 1875, an order was obtained from the court below, *ex parte*, appointing one Le Mon a translator of this French patent. Mr. Le Mon's translation is sworn to on the 30th September, 1875. Such translation, like the order authorizing it, was purely *ex parte*. This patent purports to be evidenced under a certificate from the Commissioner of the Patent Office, that the French copy is a true copy from the bound volumes in the library of the Patent Office (p. 183). The title-page of the book bears the imprint, "At Paris, 1852." Assuming that this imprint is affirmative evidence that the book was published in the year 1852 (which is not a legal presumption), there is no legal evidence that the Hediard patent was patented prior to that year. The recital in the book that the Hediard patent was issued under date of September 26, 1842 (p. 183), is not legal evidence that the patent was issued in that year. The year 1852 is therefore to be taken, but only upon an illegal presumption, as the date of the Hediard invention. Such invention is of no utility in this case, unless it was prior to the date of Nicolson's invention (*Bump's Law of Patents*, 319). On page 329 Mr. Le Mon has introduced a diagram which is not found in the original, on page 184, and as to which the plaintiff had no knowledge in the court below, and no opportunity to make any enquiry in reference thereto.

Of this Hediard patent the defendants say (p. 138) that it is substantially the same in construction as the second form of the Nicolson pavement described in the patent, except that no intervening strip is used as a boundary to the channel.

This patent was said to be illustrated by a model (Exhibit No. 41), of which the plaintiff's expert spoke as follows (p. 102):

"I have examined the model referred to in the question. It does not show the tar cement which is spoken of in the patent, and it does not represent the blocks placed as I understand the patent to direct them to be located with reference to one another. The directions in the patent being, when taken as a whole, that there should be intervals between the ends of each two blocks in the rows across the street, as well as between the sides thereof; whereas in the model the ends of the blocks are represented as touching each other. The pavement described in the patent, even if made without spaces between the ends of the blocks, as shown in the model, could not be laid practically, as there would be no guide for spacing the blocks, such as is furnished by the Nicolson strip, and no means of holding the blocks in position after they were located, which is a duty also performed by the Nicolson strip. In this model the blocks are glued fast to the plank foundation, being thus retained in place. There is no direction in the patent that they should be thus glued or held fast in any manner. The model is, therefore, incorrect, and the patent does not describe Nicolson's invention, for the reason that it gives no description of any strips, or any equivalent thereof, performing the same duties."

There is, therefore, in this patent, neither the strip described and claimed in Nicolson's specification, nor any combination with the foundation of long and short blocks and strips, with cells or channels, and concrete filling.

This concludes the evidence introduced by the defendants to establish a want of novelty on the part of the Nicolson patent, with one exception to be hereafter noticed.

The question of the want of novelty is a question

for the jury, and their verdict thereon is controlling, unless clearly against the weight of evidence. The decision of the Court below is of equal weight with the verdict of the jury, and is controlling, unless it can be seen that the Court has decided adversely to the weight of evidence. Inasmuch as no one of these seventeen patents shows the combination of Nicolson's foundation, long and short blocks, or strips and cells, or transverse channels filled with concrete, there is no ground for alleging, so far as such patents are concerned, that the Court below erred in holding that Nicolson's patent was not void for want of novelty.

18. The eighteenth, and last patent, is that of *John Hosking*, of September, 1849 (p. 133), as to which the defendants seem to have changed front. Mr. Justice Strong said, in reference to this patent (p. 46):

"Models of the Hosking and of the Nicolson pavement have been exhibited to us, and we cannot doubt that if the form of the short block or strip between the long blocks, separating them, and thus forming a groove, is not a substantial part of the Nicolson combination, and if it is not essential to that combination that the long block and short block, or strip, should have parallel sides throughout, with no rebate in the long blocks, the Hosking and the Nicolson pavement are the same in principle. And such is the evidence."

This was founded upon an affidavit introduced by the defendants, and which reads as follows (p. 20):

"Deponent has examined and understands the contents of the English Letters Patent, No. 12,761, A. D. 1849, granted to John Hosking for an improved pavement, and says that said English Hosking patent describes a wood pavement laid upon a continuous foundation of boards or concrete, and in

that respect is substantially the same as the Nicolson pavement referred to in said 1st and 2nd claims of said last reissue. Said wooden pavement consists of parallel-sided blocks of wood, arranged in parallel rows upon said continuous foundation, leaving continuous channels between them across the roadway, said channels to be filled with asphalt-concrete, and in those respects are substantially the same as in the Nicolson pavement referred to in the 1st and 2nd claims of said last reissue. Such wooden pavement also has pieces of wood or other substance placed between the parallel blocks, and forming the bottom of the channels between the blocks, and giving lateral support to the sides of the blocks, in which respect it is also substantially the same as said Nicolson pavement referred to in the 1st and 2nd claims of said reissue. And deponent says that unless said Nicolson pavement referred to in said 1st and 2nd claims of said reissue is restricted to a pavement exactly the same as described, having rectangular blocks with sides absolutely parallel, and absolutely plain surfaces, without rebates of bevels of any kind, and strips of the same character, said English Hosking pavement is substantially the same."

This Hosking patent is stated by Mr. Justice Strong to have been enrolled in March, 1850 (p. 46). The patent is not printed in the record, and therefore the plaintiff cannot give a reference to the record. The fact, however, is as stated; and therefore the Hosking patent has no effect as against the plaintiff's patent, except from the date of the enrollment of the specification. (*Howe* vs. *Morton*, 1 *Fisher*, 586.) Therefore, the question is, whether Hosking's specification of March, 1850, antedates Nicolson's invention, for unless it does reference thereto is useless.

At the time of the argument of the motion for the injunction, the animus and status of the defendants were "anything to defeat the motion"; and, there-

fore, as has been shown, the evidence was that the Hosking patent was substantially the same as the Nicolson. For the deponent stated that "the continuous foundation was substantially the same as the Nicolson; that the parallel-sided blocks, with continuous channels between them, filled with concrete, were substantially the same as the Nicolson; that Hosking's patent had pieces of wood or other substance between the blocks, forming the bottoms of the channels, and giving lateral support to the sides of the blocks, substantially the same as the Nicolson."

The defendants then seem to have changed their mind with regard to the availability and utility of this Hosking patent, and, therefore, the same deponent is found (p. 133) testifying as follows:

"The English patent to John Hosking describes a pavement to be laid upon a floor of wood or upon concrete, said pavement being composed of long and short blocks, both of which are rebated or fitted to each other in such manner that the short blocks afford a vertical as well as lateral support to the long blocks, and, consequently, form a part of the bearing-blocks of the pavement, while at the same time they separate the principal blocks, so that continuous channels are formed between them across the street, which channels are filled with asphaltum, loose stones, and similar materials, used in a semi-fluid state. This pavement I consider substantially different from that described in the Nicolson patent, because it is not formed of parallel-sided blocks, in the sense in which that term is used in the Nicolson patent, but is formed of rebated blocks, which afford vertical support, by the short blocks, to the principal or bearing-blocks of the pavement. In its characteristic feature, this pavement more nearly resembles the defendants' pavement than either of the forms of the Nicolson patent and reissues."

If this latter judgment be the correct one, then the Hosking patent is substantially different from the Nicolson patent, and the Brocklebank & Trainor Patent is void for want of novelty, because it claims rebated blocks, which are afforded a vertical support by short blocks fitting into such rebates, which is precisely the description in the Hosking Patent.

But the Hosking patent is obviously different from the Nicolson pavement in its mode of construction; and the question arises as to the utility and practicability of such a pavement; because, if the pavement as Hosking describes it had no practical utility, then it is of no value as evidence of want of novelty upon the part of Nicolson. Upon this point the plaintiff's evidence (p. 98) was as follows:

"Said models" (Defendants' Exhibits 38 and 39) "are incorrect in the fact that they do not represent longitudinal and transverse holes, which the patentee states are to be made in the blocks for the purpose of drainage, which I have indicated on Exhibit No. 38 by pencil-marks. These holes which the patentee describes, if made in wooden blocks, would so increase the cost and so diminish the strength, that they would be practically useless as paving blocks.

If the blocks in the models be so arranged that the intervals between the long blocks in one row are opposite to the centre of the long block in the next row, so that the blocks form a pavement with 'teeth or cogs on its surface,' then the models are correct, provided the lower series of blocks be bored out as represented by me in pencil, and provided also that these lower blocks are cut into lengths about as long as the upper blocks, instead of being strips, as shown in the models. These models also differ from the pavement described in the patent, in the fact that the filling of stone and cement and asphalt is not shown in the models. Several of the other models put in by the defendants differ in this

particular from the pavements which they represent, and thus give the impression that pavements with and without the asphalt filling are alike. The pavement described in the patent, and represented in the first, second, and fourth figures of the drawing thereof, which are the pavements which purport to be represented by the models, would be practically useless as pavements, owing to the fact that they have short longitudinal channels in addition to the transverse channels across the street. Those who have examined pavements in wear are familiar with the fact that the dropping of one stone below the general level soon causes a depression of many of the surrounding stones, and subsequently a large depression in the pavement. When one stone drops below the general level, the wheels of heavy vehicles going at speed actually drop down upon it, producing the effect of a heavy ram, to depress the stone. The wheels then bring up against the next high stone in succession, and either depress it or knock it out of place. In the pavements described in this patent the longitudinal grooves, each of which would be about fifteen inches or more in length, would soon have the concrete cut out of them by the wheels of vehicles; and if wheels, in passing through these ruts thus formed, did not upset the blocks which bound the two ends of the rut, or knock them to pieces, then there would be left in the pavement a series of ridges and hollows which would impede slow, and prevent fast travel over it.

My opinion, based upon observation of both stone and wood, is that those portions of the blocks which are opposite the ends of these ruts would soon be broomed up by the wheels of vehicles, thus filling the pavement with a series of ruts of irregular depth, and finally destroying the smoothness of its surface. I do not think that any inquirer who has paid attention to the subject would attempt to construct a pavement with these short longitudinal channels."

This opinion is corroborated by the fact that there is no evidence in the case showing that any practical use of the Hosking pavement was ever made at any place; and this, coupled with the patent

defects therein, as shown in the record, leads to the conclusion that the Hosking pavement was not of that practical utility which would defeat an American patent.

The date of the Hosking patent being March, 1850, the inquiry now arises, what was the date of the Nicolson invention? In deciding this question, this Court, in its opinion in the case of *Cochrane* v. *Deener*, (*U. S. Rep.*, 94,) has authorized the plaintiff to carry back the date of Nicolson's invention to the time when he commenced the experiments which resulted in the patented improvement. In the *Deener* case this was done under an American patent, issued in 1863, for the purpose of avoiding a French patent to one *Perrigault*, the specification of which was made public in September, 1860; and the patentee was allowed to prove that in June of the same year he talked about his invention, obtained permission to go to work to put it up, and employed a carpenter to assist him in constructing it.

The first step in Nicolson's invention was his preparation and filing of a caveat. The caveat was signed August 2, 1847, and was filed August 4, 1847. This caveat was accompanied by a drawing. The petition of Nicolson for its allowance recited that he had "discovered or invented certain new and useful improvements in street or road pavements, and that he is now engaged in making experiments for the purpose of perfecting the same." The invention described in the caveat was that form of the invention known as the checker-board form, consisting of long and short blocks, into the openings between which the concrete was to be rammed, and the road-bed was to be prepared to receive the pavement by covering its surface with paper saturated

with tar or other preventive to moisture rising to rot the under surface of the block. The drawings attached to the specification (p. 115) show a top view of the checker-board pavement, and also a side or sectional view. This sectional view at once suggests the second form of pavement, known as the strips and blocks—because one cannot look at the sectional view, and have in their mind's eye a sectional view of the pavement made with blocks and strips, without seeing that both sectional views would be the same. The original patent was issued August 8th, 1854, or seven years after filing the caveat. This describes and shows both the checker-board and the long block and strip form of pavement, with the concrete filling and the placing on the road-bed of the tarred paper specified in the caveat, or the other preventive to moisture, also specified in the caveat, as a covering of mortar or cement, or a flooring of cheap boards. Therefore, there is nothing in the original patent really of departure or of novelty, over what was to be found in the caveat, with the exception that the shorter blocks are continued straight across the street, instead of being broken up into rows like checkers. The reissue contains only what was found in the original patent. The reissue is to be considered as if granted at the date of the original patent, of which it is considered as the continuation. (*Bump's Law of Patents, p.* 187.)

If the reissue relates back to the original patent, the original patent, by parity of reasoning, relates back, for the purpose of determining the question of novelty, to the filing of the caveat, or to the first experiments, because the date of the experiments is properly to be assigned as the date of the commencement of the invention. If the experiments

were not completed at the date of the caveat, and the patentee went on with due and reasonable diligence to complete the same and to perfect his invention, the date of his perfected invention is properly to be carried back to the date of the filing of the caveat. If it shall be said that it is an error to assert that the block and strip form of the pavement is to be found as described in the caveat, it is to be observed that Section 12 of the Patent Act of 1836 uses this language:

"Any citizen of the United States who shall have invented any new art, machine, or improvement thereof, and shall desire further time to mature the same, may file a caveat setting forth the design and purpose thereof, and its principal and distinguishing characteristics, and praying protection of his right until he shall have matured his invention."

This is a legislative declaration that the inventor has a right to file a caveat at a time when his invention is immature. Nicolson stated in his caveat:

"That he is now engaged in making experiments for the purpose of perfecting the same, preparatory to depositing in the Patent Office of the United States a corrected specification thereof, in order to obtain Letters Patent therefor. * * * That this instrument may be considered as the preliminary application, * * * and that his right in the said invention or discovery may be protected until he shall have matured the same."

Moreover, this petition served a two-fold purpose —not only as the basis for the issuance of a caveat, but, in the language of the instrument itself, "*it may be considered as the preliminary application or petition required by law to be made in order to obtain Letters Patent.*" In this aspect of the case, the original application of Nicolson for a patent was

filed nearly three years prior to the enrollment of the Hosking specification.

In the case of *Johnson* vs. *Root*, cited in *Curtis on Patents* (3d *Ed.*, *pp.* 263, 270), the Court said:

"And it may happen that a person may choose to file a caveat while he is going on and making improvements on an invention which he has already completed so as to be of practical utility. Now, if he had perfected it, then he had a right to embrace it in a patent that he should afterward take out. If he had not perfected it, then another question will arise, and that is, had he invented the mechanism at that time, and had he used due diligence to perfect it and put it into a perfected machine, so as to make it of some practical utility? If the invention was perfected, as I have already said, or, if not perfected, if Mr. Johnson used reasonable diligence to perfect it, then he had the right to have it incorporated into his patent, and to supersede those who had intervened between his first discovery and his subsequent taking out of the patent."

This decision seems to establish the law to be, that if an invention is not perfected at the date of the filing of the caveat, and the patentee uses reasonable diligence to perfect it, he has a right to have the perfected invention incorporated in his patent, and to supersede those who have invented between his first experiments and his subsequent taking out of his patent.

If, therefore, the Nicolson patent can lawfully repose upon the date of the caveat, in 1847, as the date of the invention, then clearly it ante-dated the Hosking patent.

This view has thus far proceeded solely upon the record; but in determining when, as matter of fact, an invention was actually made, parol evidence of the acts and declarations of the inventor may be resorted to, upon the familiar principle of *res gestae.*

The next step taken by Nicolson was the laying of his pavement in different forms, on the road of the Boston and Roxbury Mill corporation, in Boston, in March, 1848. The question now under consideration does not involve the question of abandonment subsequently to be considered. The question now is as to the date of Nicolson's invention, with reference to the date of the Hosking patent.

George T. Bigelow, of Boston, was the administrator of Nicolson; he knew him intimately, and was his relative by marriage. He says (p. 85):

"There was a piece of pavement subsequent to March, 1848, and before the close of that year, laid on the road called the Mill Dam, or Western Avenue, and was opposite, or adjacent to, the toll-house on that road. I was in the habit of passing over that avenue several times every week. Sometime in the course of that year, after I had left the Bar, in passing by the toll-house, I saw Mr. Nicolson there, and had a conversation with him in reference to some business. At that time I well remember that there was a wooden pavement laid at, or near, the toll-house, which was laid with interstices, or channels, between the blocks, in appearance like that now laid and called the Nicolson pavement. At that time I knew that Mr. Nicolson had invented a pavement, or claimed to have invented a pavement, for which he had taken some steps to obtain a patent. I talked with Mr. Nicolson on the subject, and at the time above referred to I supposed that the pavement which I saw at the toll-house was constructed by Mr. Nicolson to test the invention. I entertained this supposition, because of my knowledge of the fact that he had made such a discovery, or invention, and that he was superintendent of the road or avenue where the pavement was laid, and had the direction and control of the road-bed and of its repairs. I think that the pavement was laid in more than one form. I remember only two. One with channels or interstices running across the road, filled in with gravel

or some substance, and the other round blocks without the interstices or channels."

Lang was employed by the Roxbury corporation in 1849 as a night tollman, and continued as such until September, 1851, and then as day tollman until May 1, 1863. He knew Nicolson as long ago as 1833, when he worked for him. He was asked whether there was a piece of Nicolson wooden block pavement on the Mill Dam Road, and he answered as follows (p. 76):

"There was. It was in front of the toll-house on that road, and about one-third of a mile from Charles Street, Boston. There was a strip of this paving nearest the toll-house, that was smooth and very level, so much so that I could see money on it in dry weather anywhere. I always had to walk over that pavement whenever I collected the toll. I have a very distinct remembrance of this piece by the toll-house. That nearest the toll-house was laid in rows crosswise of the street, with channels between the rows about an inch wide, filled with some kind of material or composition. I should say that it was about seventy-five feet long, and extended on each side of the toll-house—on the westerly side about twelve feet. It remained there until we moved the toll-house, about 1854, and I think for many years after that. Mr. Nicolson was there almost daily, unless prevented by sickness or by some other circumstance, and when he came he would examine the pavement, would often walk over it cane in hand, striking it with his cane, and making particular examination of its condition. He asked me very often how people liked it, and asked me a great many questions about it. I have heard him say a number of times that this was his first experiment with this pavement, and he thought that it was wearing very well. He took a great deal of interest in it, and seemed desirous to know how people liked it who traveled over it. I think that I may safely say that he has asked me about what people said of it, and how they liked it, a hundred times. He

talked with me about it so much that sometimes it was a bother to me to collect my toll when he was talking. He said that this was a good place to test it. He would come down and spend ten or fifteen minutes in looking over the pavement, and then come into the toll-house and get his money; and often, when he went, would look it over again The pavement was always before my eyes when I was in the toll-house. This road belonged to the corporation, and Mr. Nicolson had control over it at the time the pavement was laid upon it. The circumstances that made this locality desirable for the purpose of obtaining a satisfactory test of the durability and value of the pavement were: that there would be a better chance to lay it there; he would have more room and a better chance than in the city; and, besides, it was a place where most everybody went over it, rich and poor. It was a great thoroughfare out of Boston. It was frequently traveled by teams having a load of five or six tons, and some larger. As these teems usually stopped at the toll-house, and started again, the stopping and starting would make as severe a trial to the pavement as it could be put to. I saw this piece of pavement while it was in course of being laid. It was laid in 1848—either in June or in July of that year. Captain Lincoln was the head man and boss carpenter; Wilson was another carpenter, and Daniel O'Brien was another carpenter. There were other laboring men, whose names I do not remember, if I ever knew. These three men I knew well, both before and after this work was done by them. Captain Lincoln lived in Watertown. He has been dead nearly a year. Wilson is, as near as I can ascertain by inquiry, somewhere in California. O'Brien is dead. This pavement was made in three different ways, as I recollect. The block pavement, near the gutter, might be two feet wide, and was made of round, wooden blocks, sawed right off from the log—from six to twelve inches in diameter, and about eight inches long. The spaces between these round blocks were filled with tar and gravel. The other form was made of square, wooden blocks, of two different lengths. The longer blocks were

about eight inches long, and the others about half that length. The blocks were set so that a short block was surrounded by four long ones, and the space over the short block was filled with hot tar and gravel, making the whole when completed look checkered. The whole surface was then covered with hot tar and gravel, which wore off after a while. Before this pavement was laid the road was dug out, and left a little rounded out, and then some foundation laid down—boards, I think—for the blocks to rest on. If boards were put down they were tarred. I am certain that tar was used in the foundation. I think that the wood paving began at the easterly end, towards Boston, and ran, as I think, clear through to the west end of the pavement. There may have been on the west end a little piece of checkered pavement. The width was from ten to fifteen feet. The balance was taken up with the checkered pavement. That in the row form wore the best. In the checkered form, the cement under the short blocks got cut out by the horses' calks more easily, and left little holes. I know that previous to that time I had been employed by the Massachusetts Iron Company, and that I left that company the first of April, 1848, as their books, to which I have referred to strengthen my recollection, show. After leaving this company I went immediately over to the Mill Dam, and boarded with Daniel Hopkins until about the middle of April. Then Mr. Hopkins, Winslow Frost and myself, went to New York together, and came home about the last of April. When I got home the hot straightening of rails, on which I had been employed, was let out to others at a lower rate than I wished to take them. I then went back to Mr. Hopkins and boarded there until August or September of the same year. During this time I was unemployed, and it was while I was so unemployed that I was present at the construction of this pavement. I was at this time passing to and fro over the road, and had leisure to stop and examine the work. This was the only year that I was out of employment for several months together. I know, further, that when I went there as night watchman, the pavement was down

and had been in use, and I am positive that I became night watchman in July, 1849. Asa Nutting was a day tollman. Charles Stanwood was superintendent of the road, and was what we called relief tollman. He came into the employment of the company, I think, in the summer of 1854."

Nutting (p. 71) testified that he was employed by the Roxbury corporation, as night tollman, in 1846, and continued as such until some time in 1847; then went to Jaffrey and remained there for from six to twelve months, and returned to the employment of the company as day tollman in the month of June, 1849, and continued as such until sometime in 1852, when he became superintendent of roads for the same corporation, which position he held until 1854, when he was succeeded by Charles Stanwood. He became acquainted with Nicolson in 1840, and saw him almost every day until he died. He says further, when asked if there was a piece of Nicolson pavement on the Mill Dam Road when he became day tollman in June, 1849:

"There was a piece in front of the toll-house on the Mill Dam Road. It had been constructed there the year previous. I was at the toll-house while this pavement was being laid, on a visit to my brother-in-law, whom I was in the habit of visiting often. I was acquainted with the parties who laid the pavement. I also saw Mr. Nicolson there at the time. The pavement was laid by Mr. Lincoln, the boss carpenter, Mr. Wilson and Mr. O'Brien. Mr. Lincoln and Mr. O'Brien are dead, as I am informed. Mr. Wilson, I hear, is in California. It was in the summer of 1848 that the pavement was put down. I cannot state the month. It was a new thing and attracted a great deal of attention among almost everybody who traveled that road. I observed it particularly because it was a new thing, and I had never seen anything like it before. I also noticed how it was constructed. They were constructed

differently in some respects. I recollect three different forms of construction made use of in that pavement. One consisted of wooden blocks about eight inches long and blocks about four inches long, put down alternately, so that each short block should be surrounded by four tall ones, leaving a cavity which was filled up by pebbles and tar. The tops of the long blocks and the filling over of the short blocks, when completed, made a checkered appearance. Another form consisted of blocks about six inches long, set in rows, with about an inch board between them, coming up half way the sides of the centre block. These blocks were set endwise, close together, running across the street with strips of boards between the rows of blocks, leaving a space between the rows of blocks about an inch wide above the strips, which space was filled with pebbles and tar. The other form was of round blocks, sawed off from the log, and set endwise, with cavities between them filled in the same way. The piece that was set in rows was directly opposite the toll-house door, running across the street. The checkered form was each side of it. The round blocks sawed from the log were set in the gutters. The road-bed was first made in the right shape, then sand and tar were put on the road-bed for this pavement to be set upon, to the depth of from one to three inches. This was the foundation for all the kinds of pavement laid. The pavement continued to remain there until 1854 and afterwards. I am very well acquainted with Mr. Stanwood. He succeeded me in 1854 as superintendent of the road. The same pavement that I have described was upon the road when Mr. Stanwood succeeded me, and it remained there for a term of years afterward. I have a recollection of seeing Mr. Stanwood repair the pavement. Mr. Nicolson visited it almost every day when it was fair weather, and would examine it and ask how people liked the new pavement, and if there were many observations with regard to it. I had frequent conversations with him. He stated that it was for the purpose of testing the pavement, that being as hard a place as could be found, and if it could stand there it would stand anywhere. The reasons which made this locality

specially fitted to test the durability and value of this pavement were, because it was laid in front of the toll-house, where all, or most all, of the teams, heavy and light, stopped and started, making it a very trying test to the pavement. Many heavy teams traveled over the road almost every day. It was a great thoroughfare there. Mr. Nicolson was treasurer of the corporation, and had full control of the road. He said that he laid this pavement at his own expense, for the sake of testing the pavement. I observed a difference in the comparative wear of the different forms. That in the row form wore very much smoother and better than any other form that was laid. I should think that the whole length of the pavement was from seventy-five to one hundred feet, and from twenty-five to thirty feet of it, opposite the toll-house, we used to keep swept clean. From one-fourth to one-third of the entire pavement, outside of the gutters, was in rows. The balance was in the other form. The Mill Dam Road was a private road, so called, and under the exclusive control of the corporation."

Fairbrother (p. 87) said:

"I knew Nicolson in 1846, and until he died. He was acting as the agent or superintendent of the Mill Dam corporation. I saw some wooden pavement of two or three kinds, I think, on the Mill Dam road, in the summer of 1848. It was right opposite the toll-house, on the Mill Dam road. I met with an accident that spring, and I was laid up with a lame arm. That was the summer it was lame. I buried, also, a little girl, five years old, that same year. She died at South Dennis. I came to Boston from the funeral, in a packet, which arrived the day of the water celebration, which was October 25, 1848. A part of the pavement was made of logs, cut off about eight or ten inches long—eight, I think—and about three inches square. These were laid endwise, crossways of the street, with inch boards between them. The boards came up between the blocks about half the length of the blocks, I should think. I mean, by length of the block, the height from the road-bed. This was laid on a foundation. I think

some of it was laid on boards, and I think that some of it was laid on a concrete of sand and tar, as I now recollect. The board foundation was next to the toll-house. The channels above the strips were filled in with concrete of the same material. The other pavement looked like checker-board. There were four tall blocks surrounding a third block of the same size, but about three inches shorter. This concrete was put over the short block, making the whole surface level. The other kind of pavement consisted of round blocks, of about the same length, sawed off the log. These were laid in the gutter, next to the toll-house. The spaces between these round blocks were filled with concrete."

West (p. 86) testified:

"That he knew Nicolson intimately for sixty years; that he knew that he got up a pavement, and had a piece put down on the Mill Dam road, in front of the toll-house. I presume that he went over it every day. His business called him there. I occasionally went out with him. Went out with him on Sunday afternoons. He used to look at the pavement, walk over it, examine it closely, and speak to me about it. He put it down as an experiment, thinking that he could make a good thing of it. He said that he put it there for an experiment, and he hoped to make a good thing of it. I think that he spoke to me a number of times about it before 1854."

Stanwood says (p. 68):

"I was superintendent of roads for the Roxbury corporation. I became acquainted with Nicolson in August, 1854. There was a piece of pavement laid on the Mill Dam Road, opposite the toll-house, twenty-five or thirty feet in width, and it was the full width of the roadway of the dam, which was about thirty feet. It might have been larger than this. This was the part kept clean in front of the toll-house. I should think from the appearance of it that it had been laid down for a considerable time—for some years. I left in June, 1857. Up to that time there was no other pavement laid to my knowledge. There were some repairs made—a piece

about three feet long and two feet wide, near the toll-house. I witnessed those repairs. The old blocks were taken out and new blocks substituted. The bottom of the roadway was dug down to allow the new blocks to be flush with the old paving that was down, as the old paving had been worn down from an inch and a half to two inches. In making the repairs I saw how the original pavement was laid. I found that originally there was a foundation laid on the roadway for the blocks. I cannot now say whether this foundation was made of wood or of tar cement. The blocks were placed upon this foundation endwise, in rows, transversely with the street. Then a strip of board, about half the length of the blocks of wood, was placed between the rows of blocks, and the space over the tops of the blocks was filled with gravel and tar. My attention was particularly called to the strips of board, the moment I commenced to work to make the repairs. I did not know, until I commenced to make the repairs, that there were any strips between the blocks. The same mode of construction that I have above described was employed in making the repairs. Mr. Nicolson frequently examined this pavement, and I learned from him in conversation that the object in laying it there was to try the experiment—that being a place over which there was a great deal of travel. He often expressed himself as being perfectly satisfied with the experiment. The road was under the control of Mr. Nicolson for that purpose. It was the best place for trying the experiment upon the road. All of the teams, or almost all, had to stop there to pay their toll, and one great object, I understood from Mr. Nicolson, was to see what effect heavy teams would have on a pavement, in starting, and also to see if it was not easier for the teams to start on this pavement than on the common roadway. These statements of Mr. Nicolson were made to me while he was there examining the pavement, in regard to his object in placing it there, where he could give it a fair test."

This evidence conclusively proves that whether Hosking's patent has the date of the enrolled specification of March, 1850, or 1849, Nicolson's inven-

tion, in three forms, was an actual practical experiment, on the Roxbury Road, as early as June or July, 1848. The evidence of Bigelow, Nutting, Lang, Fairbrother, Stanwood, and West, was not before Mr. Justice Strong on the motion for an injunction, but that learned Justice had some reason to believe that the facts hereinbefore stated would actually be proved on the final hearing. The defendants, on the motion, introduced a pamphlet issued by Nicolson, for the specific purpose of defeating the motion for an injunction by reference to one fact contained in such statement. The statement being in, the plaintiffs contended that they had a right to use it in support of the motion, and this contention was opposed by the defendants. Thereupon Mr. Justice Strong emphatically remarked (p. 47):

"There is, however, evidence that Nicolson's invention of a grooved pavement was made as early as 1848, and consequently before the English patent to Hosking. It is found in a pamphlet issued by Nicolson in 1857, in which he asserts that he laid down such pavement in June, 1848. This pamphlet we understand the defendants to have used for another purpose on the hearing of this motion. If the fact inserted in it be established, it may be very material to the enquiry whether the patent of 1854 (*i. e.*, Nicolson's) is affected at all by the earlier patent to Hosking."

That Hosking did not anticipate Nicolson is further conclusively established by the averments in the answer, which is sworn to, and which contains this language (p. 53):

"And these defendants, for a further and more complete answer to the complainant's said bill of complaint, aver that the said alleged invention of the said Samuel Nicolson, described and claimed in the Letters Patent in complainant's said bill of com-

plaint recited, *was in* public *use*, with the consent and allowance of the said Nicolson, long prior to his application for said Letters Patent, to wit, *for six years* before said time, to wit: *from about the nineteenth day of July*, 1848, *continuously*, until the time of said application, on a certain avenue, generally known as the Mill Dam, which said avenue is a continuation of Beacon Street, in the city of Boston, in the State of Massachusetts, and connects the said city with the city of Roxbury, in said State, and its immediate vicinity. And also that the said supposed invention or discovery had been in public or common use, with the consent and allowance, and by the procurement of the said Nicolson, for more than two years before his said application for said Letters Patent, to wit, for six years before said time on the Western Avenue of the Boston and Roxbury Mill Corporation, near Beacon Street, Boston, in the State of Massachusetts, and was continuously open to public use and travel, with the consent and allowance of the said Nicolson, from about July 19, 1848, until the time of his application for said Letters Patent."

This averment, corroborating as it does the testimony of Bigelow, Nutting, Lang, West, Fairbrother and Stanwood, completely establishes the fact that Nicolson's patent is not void for want of novelty, by reason of the English Letters Patent to Hosking.

VIII.

ABANDONMENT.

The remaining defense set up in the answer is that of abandonment, and it is found in these words, being a continuation of the quotation just above given (p. 53):

"And these defendants charge that such public use of the said supposed invention for more than two years before making application for said Letters Patent worked an abandonment of the said alleged invention to the public; and that the said Nicolson did abandon and dedicate his said alleged invention to the public."

Abandonment is a question of fact, and the decision of the Court below thereon, like the verdict of a jury, cannot be set aside unless it was clearly against the weight of evidence. Abandonment means a general abandonment to the public. It is a dedication to the public—a giving up of the claim to a monopoly in the invention. It cannot be presumed. It is not favored in the law; and the burden is upon him who asserts it, to prove it beyond all reasonable question. Lapse of time does not *per se* constitute abandonment. The circumstances of the case other than the mere lapse of time may give complexion to the delay, and excuse it or give it conclusive effect. The statute has made contemporaneous public use, with the consent and allowance of the inventor, a bar when it exceeds two years, but in the absence of that and any other colorable circumstance there is no mere period of delay which ought *per se* to deprive an inventor of his patent. There must be something more than mere words, even if such had been proved in this case, in order to fasten upon an inventor an abandonment of his invention. There must be acts showing an intention to abandon it. And in deciding questions of abandonment, it is always held that the forbearance of an inventor to apply for a patent during the progress of experiment, and until he had perfected his invention and tested its value by actual practice, affords no just ground for any presumption

of abandonment. In other words, the law requires that the invention shall be intentionally abandoned, and that such intention must be proved by acts of the inventor, which leave room for arriving at no other conclusion. Or, as the rule has been concisely stated, after the issuance of Letters Patent the abandonment must be shown to be positive, actual and intentional, by some act or declaration of the inventor, or by such gross laches as indicates unmistakably an intention to abandon the invention to the public (*Bump on Letters Patent*, 246 to 251).

Neither the record nor the acts of Nicolson as proved justify the presumption or inference of abandonment.

1. The record refutes it. Nicolson's caveat was filed in 1847. It declared the invention to be then immature, but it prayed that the application for the caveat might be treated as "the preliminary application or petition required by law to be made in order to obtain Letters Patent;" and that due notice might be given to him, through his attorney, of any interfering application or applications which might be made within one year from the time of such filing of the caveat.

It is obvious, therefore, that Nicolson thought that, by filing his petition, he had accomplished two results: first, that he had made a formal application for the issuance of the patent, which would put its issuance *en route*; and secondly, that he had made an application for a caveat, which would entitle him to notice within the year, under his application for the patent. The effect of this application was to destroy the right to allege an abandonment occur-

"And these defendants charge that such public use of the said supposed invention for more than two years before making application for said Letters Patent worked an abandonment of the said alleged invention to the public; and that the said Nicolson did abandon and dedicate his said alleged invention to the public."

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ring thereafter. (*Hayden* v. *Suffolk Co.*, 4 *Fisher*, 86; 3 *Wall.*, 315; *Singer* v. *Braunsdorf*, 7 *Blatchford*, 521.)

2. The patent was issued in 1854.

3. It was twice reissued.

4. It was extended.

All these acts of the Commissioner are conclusive evidence that there was no abandonment by Nicolson.

The case of *Jordan* v. *Dobson* (2 *Abbott*, 408), is of value upon this point. The patent was surrendered, twice reissued, then expired, and laid open to the public for twenty years, and then Congress intervened and authorized an application to be made to the Commissioner for an extension, with like force and effect as if it had been made during the lifetime of the original patent. The Commissioner granted the extension. A bill was filed against the infringer. Mr. Justice Strong decided, as the head-note reads, as follows:

"The decision of the Commissioner of Patents, in allowing the extension, is conclusive evidence of all the facts which he is required to find before granting it. For example, of the fact that there has been no abandonment of the invention."

In the opinion this language was used:

"Why it was that the first patent to Golding was not extended before December 15, 1840, and why, therefore, there was an interval of more than twenty years after its expiration and before the Act of 1862 was passed, and before the extension, I am not informed by anything that appears in this case, though it was shown in the former suit on the extended patent. I must infer that there were sufficient reasons for it, without concluding that the patentee had given up his invention to the public. There could

hardly have been an abandonment without an intention of abandonment, and whether such intention existed was a proper subject for the Commissioner's inquiry. I should not be justified in reversing the conclusion to which he came."

5. Nicolson's acts repel a presumption of intentional abandonment.

Nicolson claimed to Mr. Bigelow—

"To have invented a pavement for which he had taken some steps to obtain a patent. I had seen him construct a pavement of wood in the form of models which he had in his room. I have a faint recollection of having had a conversation with him in relation to some document connected with the Patent Office in relation to this pavement" (p. 85).

West says:

"I have no doubt that, in a subsequent conversation, he told me that he was going to get a patent, but I cannot fix the time" (p. 86).

Nicolson's declarations all show that he regarded this use on the Mill Dam road as an experimental use. The road was a private road, upon which Nicolson laid down the three forms of pavement, as he said (p. 74), at his own expense, for the sake of testing the pavement. It appears that the place selected in front of the toll-gate was an appropriate one to test a new form of pavement. All the witnesses to the earlier history of the invention state that Nicolson said that the object of his laying the pavement was an experimental one (p. 70), "to see what effect heavy teams would have on the pavement in starting, and also to see whether it was any easier for teams to start on this pavement than on the common roadway." And that (p. 73) "it was for the purpose of testing the pavement, that being as hard a place as could be found, and that if it would stand there it would stand anywhere." "He was there (p. 77)

almost daily, examining the pavement—making particular examinations of its condition, and asking how people liked it, stating that it was his first experiment, that he thought it was working well, that he took a great deal of interest in it." "He claimed (p. 85) to have invented the pavement." "He used to look at it (p. 86), walk over it, examine it closely, and speak to me about it; he put it down as an experiment, thinking he would make a good thing of it. He said he had put it there for an experiment, and he hoped to make a good thing of it."

All this, coupled with the fact of Nicolson's belief as to the efficacy of the petition filed for the caveat, and his subsequent reception of the patent, repels conclusively any idea of intention on his part to abandon.

The place where the experiment was made also repels the inference of abandonment. It was on a private road, belonging to a private corporation, of which Mr. Nicolson was the treasurer, and in which he was a stockholder; and which, as is to be assumed, had given him the right to lay the pavement in the place in which he did, for the purpose of testing it as to its durability and value. He laid it at his own expense. He never received any compensation from any one for the use thereof.

Such use was not such a public use as would justify the inference of abandonment, either general or under the two years' limitation in the statute. A public use, to constitute either a waiver of a right under a statute or the fact of abandonment, means such a use in public as that the public can ascertain how to construct and practice the invention. The laying of the experimental pavement by Nicolson was not a use of his invention in public. The

public could not acquire from driving over the pavement a knowledge as to its form of construction. They could see nothing but the tops of the larger blocks and the concrete filling between. They could gain no knowledge of the fact that beneath the concrete filling was a strip supporting the filling and spacing the blocks, or that beneath the whole there was a support and preventive to moisture, whether of tarred paper or of tarred boards. This is confirmed by the language of one of the witnesses, who stated that it was not until they took up some of the pavement for repairs that he ascertained that there was a strip or a foundation connected with it (p. 69).

The only remaining inquiry is, were Nicolson's experiments with the pavement on the Mill Dam Road so long conducted that the law will infer, in the face of all the surrounding circumstances, from the mere length of time which elapsed, an absolute intention to abandon it? The law permits indefinite experiment, fairly and properly made for the purpose of experiment and of testing the value and durability of the invention. The cases are quoted in *Bump's Law of Patents* (*p.* 249). Those referred to in 1 *Baldwin*, 310; 2 *Blatchford*, 291; 3 *Blatchford*, 209, and 7 *Wallace*, 583, are illustrative of the rule that a presumption of abandonment cannot be founded upon experimental use, fairly and properly made.

1. It is to remembered that Nicolson's pavement was the first successful wooden pavement introduced into this country, and that it required ten years after the patent was issued to gain a public approval of the invention (pp. 105–6).

2. That it had to compete with stone pavements,

especially with the Belgian, the most approved form of stone pavement (pp. 104, 109, 110). The Belgian pavement was first put down in this country in 1852, in the Bowery, in the city of New York, two years before Nicolson's patent (p. 106). The Belgian pavement will last about eight years (p. 108).

3. Such competition involves primarily the question of durability, and secondly that of cost. The question of durability is self-evidently a question of time, which cannot be judicially limited save as the evidence requires and justifies. Wooden pavements were laid down as early as 1845 and 1846, and were a failure (p. 106), and they fell into disrepute (p. 106), and did not come into use again until the Nicolson pavement was laid in Chicago, in 1864 (p. 110), and in New York, in 1865, where the pavement then laid down still remains (p. 106). This proves that it took Nicolson ten years to convince the public of the value of his invention.

In view of these facts, what was it Nicolson's right to do? To demonstrate that his pavement was cheaper than stone pavement, which it is by two-thirds (p. 107), and that it would last sufficiently long to justify its use in place of the Belgian. This latter fact, that it would last sufficiently long to justify its use in place of the Belgian, could be established by continuous user only, and in a frequented thoroughfare. How long had Nicolson a right to use it in such thoroughfare in order to demonstrate its durability, without incurring the judgment of intentional abandonment? The English patented wooden pavement in Nassau Street, New York, lay but for a year or two and was then taken up (p. 106). This length of time was necessary to

establish the failure of the English pavement. How much was allowable to prove the success of the Nicolson pavement, as against an adverse public opinion? The law says that the patentee is entitled to a reasonable time. Such is the language of all the decisions. Or, as this Court said in *Agwam* v. *Jordan, supra*:

"Forbearance to apply for a patent during the progress of experiment, or until the party has perfected his invention or tested its value by practical experiment, affords no ground for presumption of abandonment."

If the Belgian pavement would last eight years, how long was Nicolson entitled to make an experiment to show that his pavement would fairly compete, considering its lesser cost, in point of durability, with the Belgian pavement, the most approved form of stone pavement? This has not been left to inference. The evidence upon the point is uncontradicted, and ought to be considered as conclusive and controlling.

Stafford (p. 104) said:

"I am familiar with wooden pavements, and have given them a great deal of study. I have taken out some six patents therefor myself. Wooden pavements have to compete with stone pavements, and especially with the Belgian pavement, which is the most approved form of stone pavement. To render a wooden pavement successful, it must appear that it is as cheap, in point of original cost, as a stone pavement, or that, if the original cost is more, such additional cost is compensated for by a saving of wear and tear, and by freedom from noise. It must further appear that a wooden pavement will be fully equal in point of durability to the Belgian pavement. The question of durability involves the resistance to wear and tear, to the action of frost and water, and a capacity to resist decay in fibre, which

appears to attack a wood pavement in a salt atmosphere, and does not appear where the atmosphere is free from that influence, as in the interior cities of the country. If I were experimenting, as an original inventor of wooden pavement, in determining the question of its durability, in comparison with a stone pavement, and had not the advantage of the practical experience of others in wooden pavements, I should need to prove by actual use the best method of laying the pavement, and the shape of the blocks and their capacity to resist the action of the elements, and the wear and tear of vehicles; and until I had fully satisfied myself by a continued use of the pavement for that purpose, I should not be able to assert that I had produced a wooden pavement which would successfully compete in point of cost and durability with a well laid stone block pavement. I think it would require at least five years for me to determine whether such a wooden pavement could be successfully used in competition with stone pavement, and in an ordinary thoroughfare. I know of no concrete pavement that has been successfully laid on a public roadway. Iron pavements have been tried in New York and in Boston, and have failed. I never heard of any wooden pavement, constructed in accordance with an English or French patent, being successfully laid in this country. I know the Nicolson pavement. It is the oldest successful wooden pavement with which I am acquainted. It has been followed by others, including my own. None of such other pavements have had any general practical use, until within the last four or five years."

Waterbury (p. 107, Q. 23) when asked—

"On an ordinary road, of ordinary soil, how long would it require a wooden pavement to be in use to demonstrate the fact that such pavement was practically cheaper, and practically as durable as a stone pavement?" answered: "It would take about six years."

Canning (p. 110, Q. 7) when asked—

"Assuming the use of an approved Belgian or Guidet pavement, and that it was desired to demon-

strate by actual experiment that a pavement could be constructed of wood, which in actual use would prove that it would last so as to compete in point of durability with those stone pavements; and that you had no knowledge of wooden pavements except such as you derived from your own personal experience—how long a time would you require in order to prove satisfactorily that a wooden pavement could fairly compete, as to resistance to wear and tear, and as to durability of materials, with those given stone pavements?" answered: "I should feel satisfied with an experience of six or eight years, if I knew nothing about it."

Upon this evidence, the Court, sitting as a jury would be warranted in finding that Nicolson had not consumed too much time in demonstrating the fact of the durability of his wooden pavement.

IX.

The Proceedings before the Master.

This brings the case to the proceeding before the Master.

At the time of the Interlocutory Decree of reference, the most noted case in the State of New York in which such a decree had been made was that of *The Troy Iron and Nail Factory* against *Corning*. The Interlocutory Decree in that case will be found in the Appendix.

The Interlocutory Decree in this case was founded upon that precedent. Its language is as follows (p. 206):

"III.—That the defendants have infringed and violated the said Letters Patent, by making, using, and

vending in the city of Elizabeth, within the jurisdiction of this Court, wooden pavements containing the improvements described in said Letters Patent, and recited in the first and second claims thereof.

IV.—That the said defendants do account to the said plaintiff for the damages or use and profits in consequence of the said infringement.

V.—That an account of the damages or use and profits be taken and stated by William J. Magie, Esq., counselor-at-law, residing at the city of Elizabeth, as Master of this Court *pro hac vice*."

This Court said in *Mowry* v. *Whitney* (14 *Wallace*, 620):

"What advantage did the defendant derive from using the complainant's invention over what he had in using other processes then open to the public, and adequate to enable him to obtain an *equally beneficial result?* The fruits of that advantage are his profits."

This was reaffirmed in *Littlefield* v. *Perry* (21 *Wallace*, 205), the Court adding, "For such profits he is compelled to account as damages."

The word "damages," as used by Judge NELSON, and as used in the decree in this case, as is shown by its being followed by the disjunctive "or," was used as a synonym or a convertible term for "profits," adopting in the decree in this case the language of Mr. Justice STRONG in the case of *Mowry* v. *Whitney*, *supra*: "Though called profits, they are really damages." That nothing else than profits was sought for or given in this case is shown by the Master's report, and by the opinion of the Court below (pp. 292 and 302), as follows:

"III.—It being conceded by the plaintiff's counsel that the bill in this case having been filed prior to the act permitting damages to be assessed, by a Master in such proceedings as the present, no damages could be assessed. I have made no assessment

of damages, but restricted my consideration to the gains and profits made by the defendants in the infringement specified in said decree."

* * * * * * *

"He further reported that the counsel for the complainants conceded before him that, inasmuch as the bill had been filed in the cause prior to the passage of the Act of July, 1870, authorizing damages as well as profits to be assessed by the Master in Equity cases, no damages could be assessed, and that he had restricted his inquiry wholly to the gains and profits of the defendants in the infringement specified in the decree."

The argument of the plaintiff before the Master, and before the Court below on exceptions by both parties to the Master's report, was submitted on printed briefs. Such briefs show the points that were raised before the Master, and are hereto annexed in the appendix, and made part of this brief.

The record shows that much irrelevant testimony, in the judgment of the plaintiff, was objected to before the Master (pp. 214, 215, 216, 218, 219, 221, 223, 224, 227, 229, 230, 232, 233). On the argument in the Court below, the plaintiff, as appears from the brief in the appendix, argued its first exception:

"That the Master erred in not excluding the evidence, which, it appears by the minutes thereof annexed to the said report, was duly objected to upon the grounds and for the reasons in said minutes fully set forth."

As to this exception the Court below said, when adverting to the exceptions of the complainant:

"1. The first is that the Master erred in not excluding certain evidence, for the reasons assigned when it was offered. The question which the counsel for the complainant seeks to raise does not properly come up by exceptions to the Master's ruling. His course was in accordance with the prevailing practice in the Circuit, to wit, taking down the testi-

mony, entering the objections of the opposing counsel, and the reasons stated for its incompetency, leaving its admissibility to be determined by the Court on the argument, *where the question would arise on a motion to strike out by those objecting.*"

This seemed to indicate that the counsel for the plaintiff had made an error in practice, in not giving notice of a motion to strike out the testimony objected to. The Court below, in thus noticing this supposed error, omitted to notice the fact, patent upon the record (p. 299), that the plaintiff gave notice for June 7, 1873, that

"The printed copy of the testimony taken before the Master, W. J. Magie, Esq., on the final accounting in this case, and with a copy of which you are herewith served, will be presented to his Honor, Judge Nixon, and *the Court will be requested then and there to strike out from such testimony the parts appearing therein to have been objected to at the time of the examination of the witnesses*, upon the grounds in the record stated at the time, why such testimony was incompetent and inadmissible."

This notice was called to the attention of the Court below on the said 7th of June, and it was then stated that the counsel for the defendants informed the Court, by letter, that he would not be able to attend, owing to his engagement elsewhere. The Court thereupon directed the application to strike out the evidence to stand over until the coming in of the Master's report, stating that "the plaintiff would not be prejudiced by the postponement" (*See Supplemental Points for the Plaintiff, on Exceptions by both parties to the Master's Report, in Appendix*).

There was one point made before the Master, for the purpose of limiting the plaintiff's recovery, to this effect, viz., That it was open to the defendants

to have laid any other of the forms of pavement shown in the English and French patents, and therefore that the plaintiff was limited in its recovery to the difference of profits accruing to the defendants between the hypothetical laying of such foreign pavement and the actual laying of the Brockle-bank and Trainor pavement, the infringement of the Nicolson. This point is sufficiently answered in the opinion of the Court below, as follows:

"We have no hesitation in holding that under the reference the evidence was incompetent. It was offered by the defendants to show that there were other forms of wooden pavement open to the public which they might have used, and made the profits, or some portion of the profits, which have been realized in the use of the complainant's invention. It is a sufficient reply to such offer to observe that the defendants preferred to use the complainant's property, and made their gains therefrom, and that these gains no less belong to the complainants because the defendants might have realized other gains by the use of lawful modes."

The simple matter of fact is, that if the defendants had laid any one of the pavements described in the foreign patents they would not have laid the Nicolson; and therefore in laying the Nicolson they did not make use of the inventions described in the foreign patents. If they had used such foreign patents they would not, in the language of *Mowry v. Whitney*, "have obtained an equally beneficial result," *i. e.*, a successful, practical wooden pavement, approved by use in Chicago and elsewhere. They laid a pavement which contained the elements, by means of the processes, described and claimed in the Nicolson patent, and none other; and they laid those according to the declaration in their patent, simply as "an improvement" upon the Nicolson

pavement, and not as an entire substitute therefor. Therefore, if the defendants had proved how much it would have cost them to have laid some other pavement, and how much profit they would have made in so doing (as to neither of which points did they offer any proof), they would not have proved that the pavement which they would have thus laid would have been the pavement containing the Nicolson combination which they did lay, or that they would have obtained an equally beneficial result, or that the property owners would have petitioned therefor. These petitioners "tied up" the defendants to lay the Brocklebank & Trainor pavement and none other, and, therefore, they could not have laid either the French or the English pavements.

The further point was made by the defendants before the Master, that an allowance should be made for the use of the Brocklebank & Trainor patent. This point also is noticed by the Court below, as follows (p. 305):

"Now what had the defendants done? In what did their infringement consist? They did not, as it is conceded they were authorized to do, take a portion of the ingredients, or elements, which constituted the combination, and add to them other ingredients or elements that were newly discovered, and which were not equivalents for those left out, thus producing a new combination, substantially different from the complainant's. They took the combination as Nicolson had formed it. They seized the whole of his invention. There is nothing in his patent which is not contained in the Brocklebank & Trainor patent. But they did more than this. They added a new feature to the Nicolson combination. They rebated the blocks on one or both sides in a dovetailed or vertical form, and beveled the strips to suit the rebates, which addition it is claimed made a mechanically different structure and was an improvement, in that it guarded against the displace-

ment of the strips or short blocks and distributed the pressure upon the pavement over a larger surface. * * * We are then brought to the inquiry, what effect should the improvement of the defendants have upon the question of complainant's profits? It undoubtedly added to the expense of laying the pavement, and to that extent diminished the profits of the whole work. If it had lessened the cost it is quite evident that the amount saved ought to be credited to the improvement. Upon the same principle, why should not the sum expended in consequence of the increased labor of the addition be charged to it? But without troubling ourselves further with this aspect of the case, it seems to us that the relative value of the defendants' addition to the complainant's invention ought to have been the subject-matter of evidence before the Master, although neither party offered specific testimony in regard to it; and the burden of proof was obviously on the defendants. They had been adjudged infringers. They had appropriated the complainant's invention, and realized from its use large profits. Their books of account were produced, and exhibited the gross amount. From this they asked the Master to make deductions, and it was for them to show what deductions should be allowed. They had caused a mingling and confusion of rights by unlawfully adding an improvement of their own to the property of the complainant, and it was their duty, and not the complainant's, to prove what proportion of the profits, if any, ought to be credited to the changes which they had made in the combination of the complainant. * * * If any authority be required it will be found in *Carter* v. *Baker* (4 *Fisher*, 420), where the learned judge of the 9th Circuit, in charging the jury upon this precise question, said: 'If the defendants have improved their machine, and if any of the profits are properly credited to the defendants' improvement, they do not belong to the plaintiff. But as the defendants have wrongfully connected the plaintiff's improvement with their own, and thus caused the confusion of rights, if any portion of the profits are properly to be credited to the defendants' improvement, the burden rests upon

them to show affirmatively that fact, and how much of those profits ought to be credited to this improvement and deducted from the profits of the sale of the whole machine so improved.' As no affirmative proof was offered, the Master made no apportionment of profits to the defendants for any speculative value added to the invention by Brocklebank & Trainor, unless we regard in that light the $13,868.42 claimed by them and allowed by the Master, for the royalty or license fee paid for the use of that patent in laying the pavements, and to which we shall more particularly refer when we come to consider the exceptions to his report."

The Master reported as follows (p. 294):

"Defendants further claimed that there should be allowed, and deducted from the gross profits, $13,868.42, claimed to have been paid as a royalty or license fee for laying 69,342$\frac{8}{10}$ square yards of said pavement under the Brocklebank and Trainor patent. It appearing that said pavement, decreed in the cause to be an infringement of the plaintiff's patent, contains a novel feature, alleged to have been an improvement and patented, and that the license to lay the same was upon the payment of such license, for which has been paid, I find and allow, said sum of $13,868.42, as a proper deduction."

The Court said:

"6. The defendants were the licensees of Brocklebank and Trainor, and had agreed to give them, as owners of the patent, a royalty of twenty cents for every square yard of pavement put down. The quantity laid amounted to the above sum, and Mr. Tubbs testified that it was paid to Brocklebank and Trainor. Mr. Moore, on the other hand, says that the amount was in fact paid by the Company, and that $729.80 went to Michael Doyle, and the balance to Captain Tubbs. It does not concern the present inquiry to whom the money was paid, if it was in truth a legitimate expense to be deducted from the profits. * * * We have already considered the question whether the Master ought to have made an allowance to the defendants, as the licensees of the Brocklebank and Trainor patent, for their addition

to the Nicolson invention, and have held that, in the absence of affirmative proof on the part of the defendants of its value, he was justified in giving no credit for such addition. But here we have a different question. The contracts on which the profits were realized were for the use of the Brocklebank and Trainor pavement. No other could be put down. The defendants had bargained to pay the above sum to its owners wherever they used the patent, and so far as it appears, had made the bargain in good faith. It was an expense necessary to be incurred in order to fulfill their contract. They agreed to pay, and did pay, in fact, twenty cents per square yard for the Brocklebank and Trainor improvement. Perhaps the improvement did not contribute so much as that towards the aggregate profit of the enterprise. It is difficult to apportion in such cases. But if it did not, is not the burden of proof here shifted, and ought not the complainant to have shown affirmatively that the expenditure then made was unnecessary or extravagant in amount? This was evidently the view which the Master took, and in default of such proof we are not prepared to affirm that he erred in allowing the payment as a deduction from the profits."

It is necessary now to look carefully at the case as presented to the Master. He found (p. 293), that the full number of yards laid by the defendants was $72{,}042\frac{8}{10}$. Of this amount 2,700 yards were laid in Plainfield, and 5,003 yards were laid in Sherman Avenue, under a special agreement. This left, as having been laid in the city of Elizabeth, $64{,}339\frac{8}{10}$ yards. To this amount the defendants added the 5,003 yards laid on Sherman Avenue, and thus made the $69{,}342\frac{8}{10}$ square yards upon which the twenty cents per yard was paid to Brocklebank and Trainor. The inquiry with which we have now to do is with regard to the city of Elizabeth and the $64{,}339\frac{8}{10}$ yards laid in that city, apart from the 5,003 yards on Sherman Avenue.

1. As the Court finds, all of the amount allowed by the Master and confirmed by the Court, viz., $13,868.42, with the exception of $729.80, was paid to the defendant Tubbs, and he realized that as profit by reason of having laid the infringing pavement. If the infringing pavement had not been laid, that amount of money would not have been received by Tubbs as profit. Therefore it was a profit which came directly from infringement.

2. If the defendants' pavement cost more than the Nicolson, such additional cost was allowed by the Master, who allowed all expenses for material and labor, and so reduced the gross profits of $310,198.29 to $123,610.78 (p. 293); thus stating and liquidating the account, as between the defendants and their enterprise, and showing how much net profit they made, as between themselves and the City.

3. All of the contracts under which the Nicolson pavement was laid specified $4.50 per yard as the price to be paid by the city (p. 234). The plaintiff proved (p. 207), and put in evidence before the Master (pp. 207, 211), the contracts between the City and the New Jersey Wood Paving Company (which are annexed to the stipulation, not yet printed), in each one of which the agreed price for the Brocklebank and Trainor pavement was also $4.50 per square yard. Inasmuch, therefore, as the price per square yard *was the same for both pavements*, it cannot be said that the City paid, or that the other defendants received, any sum whatever for the use of the Brocklebank and Trainor patent over and above what the plaintiff received for the use of the Nicolson patent.

4. The profits of the Nicolson pavement in the City of Elizabeth were, as between the pavement and the City, without any such deductions as have been made by the Master in this case, $1.90 per square yard (p. 210). The Master finds that, as between the Brocklebank and Trainor pavement and the City, the profits of the defendants amounted to $123,610.78. Dividing this by the $64,339\frac{8}{10}$ square yards laid, gives a profit of $\$1.92\frac{12}{100}$ per square yard; so that the two companies were about equal in these regards. As against this gross profit, the Master allowed $13,868.42 as the price paid by the defendants to themselves for the use of the Brocklebank and Trainor patent. This price was the estimate placed by the defendants upon the value of the Brocklebank and Trainor invention as an adjunct to the Nicolson. In other words, the defendants stole the Nicolson patent, supplemented it by the Brocklebank and Trainor, and all that it cost them so to do was the license fee of 20 cents per yard, or $13,868.42. This was all that the proof showed that the defendants were entitled to—either for additional cost of laying the Brocklebank and Trainor pavement, or for profit for the use of the Brocklebank and Trainor patent. The 20 cents per square yard was not paid by the City as and for profits for the Brocklebank and Trainor pavement. It was allowed by the defendants themselves, as their own estimate of the worth of the Brocklebank and Trainor patent, and it was an ample allowance.

5. That this sum was ample is proved by another fact. The Master reported that

"The defendants claimed (p. 294, Par. 10,) a deduction for $25,000 claimed to have been paid for an

interest in the patent of Brocklebank & Trainor, which I refuse to allow."

Tubbs testified as follows (p. 242):

"I could not tell to whom the $25,000 paid for it was paid, or when it was paid, without looking at the books. I know it was paid, because I had something to do with the transactions at the time. I then owned one-third of the patent, and sold one-fourth of the patent to the company. The company paid the $25,000 according to my directions. The $25,000 went to my individual benefit and to the benefit of Crane, Tubbs & Co. It was paid out of the moneys in the possession of the Wood Paving Company, and most of the money in their possession came from the city of Elizabeth. Q. You have stated that you owned one-third of the Brocklebank & Trainor patent, and that you sold one-fourth of the patent to the New Jersey Paving Company for $25,000. What did you pay for the one-third interest?

The witness declines to answer the question until he has an opportunity to consult his counsel.

"Q. Is not your counsel now present, and if he is please take all the time you wish to consult with him?

Mr. Blake states that he is not prepared to advise on the question without reflection.

"Q. Was the amount that you paid for one-third of the patent paid in cash?

The witness declines to answer this question, on the advice of his counsel, for the same reason.

"Q. Was the one-third interest purchased from Brocklebank & Trainor directly, or from some third person?

The witness declines to answer under like advice, and for the same reasons.

"Q. Have you sold the balance of your interest in the patent, and if so, for how much?

The witness declines to answer under the like advice, and for the same reasons."

Moore stated as follows (p. 252):

"Q. You stated that at the time of the purchase of one-fourth interest in the patent there had been some expenses paid in the suit, which was chargeable and charged to Brocklebank & Trainor? Did you refer to this suit brought by the American Nicolson Pavement Company? A. Yes, sir. Q. Can you state how much of that $25,000 was paid or retained to be paid on account of such expenses? A. $10,000. Q. To whom was the difference between $8,000 and $10,000 on the $25,000 paid for one-fourth interest in the patent? A. There were two parties interested in it. It was paid to them—Captain Tubbs and Andrew Dutcher. Q. Please state the proportions? A. Mr. Tubbs had three-fourths and Mr. Dutcher one-fourth of the balance."

It affirmatively appears by this evidence that the allowance by the Master of $13,868.42 was an abundant allowance for the use of the Brocklebank & Trainor patent in laying 64,339$\frac{8}{10}$ square yards in the city of Elizabeth. If one-fourth of the whole patent in the whole United States was worth only $25,000, it needs no argument to show that the allowance of $13,868.42 for its use in the city of Elizabeth was a full and ample compensation. Inasmuch, however, as the majority of the amount so paid went to Tubbs, one of the principal defendants, the question still remains open whether he is not liable to refund that amount as profit made by the use of the Nicolson invention.

6. There was a further question presented on behalf of the defendants in the Court below. It was not presented to the Master. As stated by the Court below (p. 306), it is this:

"The complainant is limited by the terms of its license to the compensation or royalty of thirty-one cents per square yard, fifteen cents of which is pay-

able to it, and sixteen cents to the owners of the extended patent."

This point was not raised in the answer. It concedes the novelty and the validity of the patent and the infringement thereof, and it unwarrantably assumes that the New Jersey Wood Paving Company could have lawfully become a bidder at public auction for the right to use the Nicolson patent on Sherman Avenue and the other specified streets. This it could not have lawfully done, *because the petition of the property-owners required the use of the Brocklebank & Trainor patent.* The point was raised for the first time after the Master had made his report. What was raised and discussed before the Master is shown in the Briefs in the Appendix. After the Master had made his report, the defendants sought to raise this point as having been actually raised before the Master; and for that purpose they asked the complainant to consent to the formal supplementary report by the Master, as appears in the record (pp. 295, 296). The plaintiff so consented, and thereupon there was spread upon the record, for the first time, this objection by the defendants, as if it had been presented formally to the Master and argued before him. Such formal report says:

"The defendants asked me to rule that, if any profits were due for the use of said Nicolson pavement, that then the complainants were only entitled to recover 15 cents per yard of said pavement under the contracts Complainant's Exhibits Nos. 1, 2, 3 and 4; but I declined so to rule, and the defendants duly excepted. Defendants further requested me to find that, under the statutes in the State of New Jersey, the Nicolson pavement, when the defendants laid their pavement, could not have been lawfully laid, and that therefore no profit was due to complainant; which I refused so to rule, and to which defendants duly excepted."

Both of these hypothetical exceptions were argued without objection in the Court below, and decided by it adversely to the defendants. The argument of the Court below is sufficient upon both points. But the plaintiff desires to add one or two suggestions with regard to the point first raised—that the plaintiffs were only entitled to recover 15 cents per yard, by reason of the contracts of license constituting a chain of title in the plaintiff—which were not alluded to by the Court below in its opinion.

1. The defendants are strangers to the plaintiff's title, and therefore are not entitled to enforce any of the provisions therein contained.

2. The criticism that the assignment from Bigelow to Learned & Goodwin, Complainant's Exhibit No. 3 (pp. 63–65), was not recorded, but was surreptitiously kept back from the knowledge of the defendants, is without foundation. (*a.*) The original paper was not in the possession of the plaintiff, and it had neither the power nor the right to record it. (*b.*) The paper was put in evidence on the 15th of November, 1870, and the alleged claim of right thereunder by the defendants was not made until after the Master's report, which was filed November 10, 1873 (p. 297).

The license from Bigelow, Learned & Goodwin to Jenkins & Milliken gives (p. 63):

"To the said parties of the second part the sole and exclusive right and license to construct and lay, *or to authorize or license others to construct and lay the said patented* pavement in all the cities, towns and places within the State of New Jersey, except the city of Jersey City, in said State, upon the terms, conditions and stipulations hereinafter contained, upon the prompt and faithful performance of which this contract and the continuance thereof is hereby expressly made to depend.

"*First*—Said parties of the second part hereby acknowledge the validity of the patent and of the reissue and extension thereof, and agree that they will in nowise infringe the same.

"*Second*—The parties of the second part *and their associates and assigns* shall use all reasonable diligence and skill to secure the introduction of the said patented pavement into general and extensive use.

"*Third*—The parties of the second part agree to pay * * * 16c. a square yard for each and every square yard of the same, which shall be laid in the territory named, either by the parties of the second part or by any *person* or *persons by them authorized or licensed.*

"*Fourth*—Said parties of the second part covenant and agree * * * that the said pavement constructed by virtue of said license shall be laid in a skillful and workmanlike manner.

"*Fifth*—That they will report the number of square yards laid by themselves, *and also the names of any person or persons who have been licensed by them to lay the said pavement in any part of the said territory*, with the date, duration and terms of said license and the portion of said territory therein included; that they will pay the license-fee of 16c. per square yard on *all and any* of such pavement which has been laid at any place in said territory, and accompany the reports by official certificates.

"*Sixth*—The parties of the second part shall have *the right to license any other person or persons* to construct and lay the said pavement in any part of the territory herein included; and the parties *of the second part shall be responsible for the prompt payment of the license-fee*, and for the fulfillment of all the terms and stipulations as to reports, certificates and otherwise which are herein contained and provided."

This was the end of the granting or conveying part of the instrument in question. By its terms, sub-licenses were authorized, and the original licensees were made guarantors of the fidelity of the sub-licensees. There, then, comes not a cove-

nant nor an agreement, but a right of forfeiture reserved to the parties of the first part, under which reservation the position of the defendants is taken. It is as follows:

"The said parties of the first part shall have a right to declare this contract at an end for a violation of any of the conditions and covenants therein, and upon any of the grounds hereinafter stated."

Thus it appears that this right as to subsequent matters was not made by the parties, as between themselves, either a condition precedent or independent, or a covenant, but simply a ground of forfeiture—

"1. For the failure or neglect of the parties of the second part (not of their assigns) to use due and reasonable skill and diligence in introducing and securing the adoption of the patented pavement.

"2. For the failure or neglect * * * to pay the license fee.

"3. For a failure or neglect to make the quarterly reports in writing."

Then comes the final clause, which is neither a covenant nor condition, and if it were it would be independent, not revoking the contract, but leaving the parties to their remedy in damages, in these words:

"If it shall, by reason of decisions of the Courts or otherwise, be found impracticable for Jenkins & Milliken" (not for their sub-licensees) "to obtain contracts for laying said pavement in any town or city in said territory, to be made with them" (Jenkins & Milliken), "or the work of constructing such pavement is required by law to be let under public lettings open to general competition, then the said" Jenkins & Milliken "agree that they will grant to any such town or city desiring to lay the same, a license so to do, upon a license fee not to exceed the sum of 31c. a square yard, or will publicly authorize

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"*Second*—The parties of the second part *and their associates and assigns* shall use all reasonable diligence and skill to secure the introduction of the said patented pavement into general and extensive use.

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any person or persons desiring to bid at such lettings, to lay the same upon the same terms as above stated, of which sum the sum of 16c. shall in every case be made payable to the said parties of the first part, as hereinbefore provided; but for the fulfillment of any such contracts or licenses made or granted as in this clause provided, the said parties of the second part shall be in no wise responsible."

The argument of the defendants upon this clause is, that because the property-holders, under the amendment to the Charter of the City of Elizabeth, had petitioned for the laying of the Brocklebank & Trainor pavement, the plaintiff could not lay such pavement, and the defendants had a right (the plaintiff being in that condition), as against it, to use the Nicolson pavement upon the payment of 16c. per square yard. The reasons why this position is unsound are so forcibly stated by the Court below in its opinion, that it is unnecessary to add anything to them; but one or two further suggestions can be made confirming and strengthening such reasons.

In so far as this particular agreement in relation to the conduct of Jenkins and Milliken, in the event that they found it impracticable to obtain contracts for laying the Nicolson pavement, is concerned, it is to be said:

1. That it is a subsequent and independent agreement, and if it shall be said that it is a condition, then it is a subsequent and independent condition, which does not go to the whole contract, but which, on the contrary, leaves the entire grant in force. The utmost that could happen would be a right of forfeiture for condition broken. The contract would remain mutually binding until such forfeiture was declared. (*Heald* v. *Wright*, 75 *Ill.*, 17.) For such forfeiture, equity would not relieve by compelling a

reconveyance, but would leave the parties to their remedy at law (*Livingston* v. *Tompkins*, 4 *Johns. Ch. Rep.*, 415; *Nelson* v. *Oren*, 41 *Ill.*, 18; *Bennett* v. *Pixley*, 7 *Johns.*, 249); and the fulfillment of such covenant or agreement is not a condition precedent to the vesting of the title. (*McCullough* v. *Cox*, 6 *Barb.*, 386.)

2. The grantors of Jenkins and Milliken had a right to waive the forfeiture, and to proceed against their grantees in an action for damages for failure to perform the covenant. (*Stuyvesant* v. *Davis*, 9 *Paige*, 431.) If this be so, it establishes the fact that the granting clause of the license was not void, but remained in force for the benefit of the sub-licensees.

3. This cause of action in favor of Bigelow, Goodwin and Learned was personal to them, and could not be assigned so as to convey a good title to an assignee (*Mitchell* v. *Warner*, 5 *Conn.*, 497; *The People* v. *Society*, 2 *Paine*, 545); and if they had undertaken to assign such right of action, the attempt would have been defeated under the policy of the law, which does not permit the assignment of such causes of action.

4. So, on the contrary, if the covenant had been by Bigelow, Goodwin and Learned, that they, on the happening of a given contingency, would have indemnified and saved harmless Jenkins and Milliken from any loss, it is clear that such covenant would not have inured to the benefit of any sub-licensee. In *Brewer* v. *Marshall* (19 *N. J. Eq.*, 537), a covenant made by a vendor of real estate, that neither he nor his assignee would sell any marl from off the premises adjoining the tract conveyed, was held not to

be enforcible in equity against the alienee of the land intended to be burdened by such covenant.

5. This particular clause in the agreement is not of that kind which passes with an assignment of a license, but is personal only. A covenant with an assignment of a ferry by the owner of the landing places, that the plaintiff might cross the ferry toll free, does not run with the franchise, and, therefore, does not bind the assignees. If a toll-keeper covenants with one of his neighbors that he might travel toll free, and afterwards assigns his section of the road, the assignee is not bound by the covenant. If a mail contractor covenants that one may ride in his coach without charge, such an agreement does not bind the assignee of the mail contract, and of his stock and coaches. (*Morse* v. *Garner*, 1 *Strobh.* [S. C.], 514, 521.) So, if A. and B., being the owners of adjoining premises, agreed that A. might build a party wall, and that when B. used the wall he should pay one-half the cost thereof, such covenant will be held to be a personal one, and not to pass with the land to the grantee of A. (*Bloch* v. *Isham*, 28 *Ind*, 37.)

The particular agreement in question did not, as matter of law, run with the title.

In *Hurd* vs. *Curtis* (19 *Pick.*, 459), the several owners of mills, drawing water from the same stream by means of the same dam, entered into an indenture, in which for themselves, their heirs, administrators, and assigns respectively, they covenanted with each other and their respective heirs, administrators and assigns, that they would erect and use wheels of a certain construction and limited power in their respective mills. It was held that there was no privity of estate between the parties to

the indenture, and consequently that the covenant did not run with the land and bind the grantee of one of the mills, the Court saying that to make a defendant liable to an action on a covenant, there must be a privity between him and the plaintiff.

And here, bearing in mind the fact that Jenkins and Milliken did not assign their license *in totidem verbis*, but carved out a new license, there was no privity of estate between the plaintiff and Bigelow, Goodwin, and Learned, in reference to the particular agreement in question.

So in *Wheelock* v. *Thayer* (16 *Pick.*, 68), it was held that a conveyance of a privilege of drawing water from a pond is not a conveyance of land, and consequently a covenant respecting the privilege cannot be said to run with the land, and cannot be enforced in an action by the assignee of the grantee.

6. Inasmuch as it has been already stated that this particular clause in the agreement was not inserted in the sub-license from Jenkins and Milliken to the plaintiff, this Court cannot imply it as matter of law. For, in the cases of the *U. S.* v. *Segui* (10 *Peters*, 306), and the *U. S.* v. *Rodman* (15 *Id.*, 13), the Court said, when no condition is attached to a grant, but it is absolute in its terms, the Court cannot establish one by implication. Therefore, if the plaintiff did not fulfil the agreement of Jenkins and Milliken, the remedy of their grantors was a personal one against them sounding in damages, or was confined to a right of re-entry, which equity, as has above been shown, would not have enforced.

This may be further illustrated by authorities:

"But though an assignee of the lessee would be

bound to insure, repair, pay taxes, rent, &c., a sub-lessee would not, nor the assignee of such sub-lessee." (*Wash. Real Prop., Vol.* 1, 4 *ed.*, 329.)

"There is no doubt that the covenant on the part of the lessees in Varian's lease, to pay the taxes and assessments, is a covenant real running with the land, and that an action could have been maintained on it by the lessor against an assignee of the lessees; but it is equally clear that no action can be maintained on it against an under-tenant of the lessees, or against an assignee of such under-tenant." (*Martin* v. *O'Conner*, 43 *Barb.*, 521.)

"There is," says Earle, *J.*, in *Cole* v. *Hughes*, 54 *N. Y.*, 444 (also quoted in 2 *Wash.*, 4 *ed.*, 585), "a wide difference between the transfer of the burden of a covenant running with the land and the burden of the covenant—or, in other words, of the liability to fulfil the covenant, and the right to exact the fulfillment. The benefit will pass with the land to which it is incident; but the burden or liability will be confined to the original covenantor, unless the relation of privity of estate or tenure exists or is created between the covenantor and covenantee at the time when the covenant is made."

7. This last stipulation in the agreement was, therefore, an independent portion of the contract, having no relevancy to the granting clause. It did not in any way affect the title of Jenkins & Milliken. If they refused to perform, Bigelow, Learned & Goodwin might have had one of two remedies—either to enforce the forfeiture, or to sue in damages for the breach of the particular agreement. But the particular agreement had no effect upon the question of title in Jenkins & Milliken, or upon their right to

exercise their conceded power of granting sub-licenses, nor did it bind such sub-licensees.

8. The defendants were strangers to such license, and cannot avail themselves thereof. They were neither parties nor privy to it, and they did not claim under it. As to them it was *res inter alios actæ*.

9. The contingencies specified in the particular agreement never arose. It was not impracticable for the plaintiff "to obtain contracts." The work could not "be let under public lettings," for the petition of the property owners prevented such public lettings.

10. The plaintiff never became the assignee of the contract between Bigelow, Learned & Goodwin and Jenkins & Milliken. Other clauses of the original license were made, binding upon them as sub-licensees. This particular one was not.

The Court below says (p. 307):

"The complainant's title was derived from Jenkins & Milliken, by license dated September 5, 1868, and the license was taken upon and subject to the same terms, conditions and stipulations, on which its grantors held the patent."

This, as matter of recital, was an error. The complainanant's title was not taken upon and subject to the terms, conditions and stipulations on which Jenkins & Milliken held their license from Bigelow, Learned & Goodwin, nor did the parties intend that it should be. This is very clearly shown by the language of the license from Jenkins & Milliken to the plaintiff (p. 66). That license recites the issuance of the patent, the death of Nicolson, the appointment of Bigelow as his administrator, the extension of the

patent, its reissue, that Learned & Goodwin, by grant from Bigelow, have become the owners of one-third share in the patent in New Jersey; and then continues:

"Whereas, the said Bigelow, and the said Learned & Goodwin, have, by an instrument in writing by them signed, bearing date August 14, 1868, given, granted, conveyed, and assured unto the said Jenkins & Milliken the sole and exclusive right and license to construct and lay, and to license and authorize others to construct and lay, the said patented pavement in the territory hereinafter mentioned, during the entire period of the said further or extended term of the said patent, upon the terms, conditions, and stipulations in the said instrument contained; and whereas the said party of the second part *desires to purchase the right and license to lay the said patented pavement in the territory hereinafter mentioned, upon the terms, conditions, and stipulations*" (not those contained in the license from Bigelow, Learned & Goodwin, to Jenkins & Milliken, but upon the terms, conditions, and stipulations) HEREINAFTER CONTAINED.

"Now, therefore, we the said parties of the first part, in consideration of the covenants and agreements of the said party of the second part, *hereinafter contained*, do hereby covenant and agree, to and with the said party of the second part, that we will give, grant, and assure, and we do by these presents give, grant, and assure, to the said party of the second part, the sole and exclusive right and license to construct and lay, and to authorize others to construct and lay the said patented pavement within the State of New Jersey, except Jersey City, during the entire term of the said extended term of the said patent, upon the terms, conditions, and stipulations HEREINAFTER CONTAINED, upon the prompt and faithful performance OF WHICH this contract and the continuance thereof *is hereby expressly made to depend*. 1. To pay a royalty of 16 cents a square yard. 2. To acknowledge the validity of the patent, its reissue and extension, and not to infringe upon or deny the validity of the same. 3. To lay the

pavement in skillful and workmanlike manner, in accordance with the specification. 4. To use all reasonable diligence and effort to further the introduction of the patent pavement. 5. To make quarterly reports, accompanied by a certificate of the proper officer, and in case of failure or neglect to pay, or to make the report, accompanied by the proper certificate, or to use due and reasonable diligence in introducing the pavement, the parties of the first part have the right to declare the agreement at an end, and thereupon all the rights conveyed revert and reinvest."

This was the extent of the undertaking of the plaintiff. It never became bound either directly or indirectly, expressly or by implication, to fulfil so much of the agreement between Bigelow, Learned & Goodwin, and Jenkins & Milliken, as related to the granting of licenses in case it was found impracticable, for the reason assigned, for Jenkins & Milliken to lay the pavement in any particular place. Inasmuch as the plaintiff did not become a party to any such agreement, the same, whatever may be its effect as between Jenkins & Milliken, and Learned, Goodwin & Bigelow, cannot be foisted upon the complainant as a voluntary assumption by it of the particular condition. It would seem to have been an error, therefore, to hold that the license of the plaintiff "was taken upon and subject to the same terms, conditions and stipulations upon which Jenkins & Milliken held the patent." It was not taken upon such terms and conditions.

The plaintiff did not become an assignee of the license. It did not undertake to step in or adopt the covenants and agreements of Jenkins & Milliken. All these covenants and agreements were left in full force. The plaintiff agreed as sub-licensees only to pay *Jenkins & Milliken*, and to *report to them*. It did

not agree to do anything with or for Bigelow, Learned & Goodwin, and they could not have enforced the forfeiture against it.

11. The defendants procured and insured all "the impracticability and necessity for public lettings" that may have existed, and cannot take advantage of their own wrong.

12. The point comes too late. Had it been made issuable when the license was introduced (pp. 56, 57), on the 15th November, 1870, the plaintiff might have proved a very probable fact, that Bigelow, Learned & Goodwin agreed to waive the particular clause, and that it was so waived.

The defendants called Milliken as a witness, and undertook to prove by him certain facts to deteriorate the quality of the Nicolson pavement. This was duly objected to, and it was clearly incompetent. Milliken was in equity the plaintiff's grantor, and his statements were inadmissible (*Many* v. *Jagger*, 1 *Blatch. C. C. R.*, 372). Had the plaintiff known at the time of the cross-examination of Milliken of the intention to take the subsequent point, it would have examined him in reference thereto, and also Messrs. Bigelow, Learned & Goodwin. It has been deprived of this opportunity by the laches of the defendants, and it ought not to suffer thereby.

X.

Though a Bill in Equity, this is really an action for tort, in which all the tort feasors may be jointly sued. All the defendants here took an active part

in the infringement. The city of Elizabeth was notified, before any of the infringing pavement was laid, of the claim of the plaintiff, and it then required Tubbs to give a bond in $50,000 before it would award him the contract. But this is not all that the City did in the way of securing indemnity. Tubbs says (p. 36):

"On the afternoon of the day to which the Council had adjourned to meet, I saw or heard that one R. W. Adams was to put in a statement to the City Council threatening interference in case awards of contract should be made to the Brocklebank & Trainor patent, stating in substance that the Court had decided against it and in favor of the Nicolson patent. Upon such hearing, I entered a paper to said City Council, which was received before the Council, denying that the said Brocklebank and Trainor pavement had ever been laid, and hence no action could have been had by any courts having jurisdiction over the same. *The Council were in favor, or appeared to be so, of giving the contract to the lowest bidder.* Apprehending the Council might be influenced by said Adams' threats, I voluntarily made proposals to indemnify the city and the people owning property along the lines of the streets to be paved, against any harm whatever from the American Nicolson Company, or any one else, by reason of awarding any or every contract to lay the Brocklebank and Trainor patent wood pavement; I did voluntarily offer to the said City Council my bond, properly secured, in the penal sum of $25,000, and another of like security of $15,000. The Law Committee of said Council reported bonds correct, and they were accepted by the City Council as sufficient security. Subsequently the $15,000 bond was returned. The City Council granted the prayers of the petitioners, awarded me the contract for paving said avenue, called Newark Avenue. After said contract was awarded, I voluntarily offered the City Council—after said contract had been awarded several weeks—my bond of indemnity for and in the penal sum of $50,000, which

bond, properly secured, was accepted by the City Council, and which bond was to secure the city against the threats of the American Nicolson Company, which, with the other bonds now held by the city, amount to $75,000."

A comparison of dates show the reason of Tubb's conduct. The Council "were in favor of giving the contract," *i. e.* for Garden Street (see the $50,000 bond, p. 117), "to the lowest bidder." Tubbs wished it for himself. The plaintiff petitioned against the grant, November 17, 1869. The "Council adjourned." Tubbs gave his bond, and then, February, 18, 1870, secured the contract. Before he knew whether he would receive it he went to the State Legislature, through his friend James S. Green (*see the charter in the appendix, which names him as a director*), and procured the passage of the amendment of February 9, 1870. This had a two-fold object: first, to get the contracts for Tubbs and his friends, if they could be secured; and second, to kill the Nicolson contract. This is shown by the language of the amendment: "And the owners shall remonstrate in writing against the use of any specified patent, *or* petition for the use of any specified patent, &c." Tubbs thought that this was better than giving bonds, and if he could not get the property owners to petition in favor of the Brocklebank and Trainor patent, he could at least get them to remonstrate against the Nicolson. The city, however, accepted the bond, and the other bonds, and thus took and retained said security to the full extent of the amount now claimed; and, therefore, it advisedly assumed the position of a co-infringer, and a co-tortfeasor, and as such it is liable with the other defendants for the profits of which the plain-

tiff has been deprived (*Reutgen* v. *Kanowrs*, 1 *Wash.*, 168.)

As was said in the case of *Poppenheusen* v. *Gutta-Percha Co.* (2 *Fisher*, 62), when one in the employ of a corporation does an act in the business of his employment for the benefit of the corporation, which it adopts and approves, and takes advantage of (and especially takes security for) it, it will be deemed to have authorized the act, and will be as much bound by it as though expressly authorized. So also in the case of *Kneass* v. *Schuylkill Bank* (4 *Wash., C. C. R.*, 9), it was held that where a corporation, acting in that character, directs an act to be done which infringes the rights of a patentee, it may be sued therefor in an action on the case.

XI.

After the cause was submitted to the Master, the defendant Tubbs went to Chicago and procured some sort of a license (not printed in the record) from Goodwin & Larned, of which, as appears by the record (*Amdts., p.* 14, *fol.* 40), he sought to avail himself on behalf of all the defendants as an estoppel, or a competent license from the original lessors to the plaintiff. This was duly objected to.

Clearly, no license obtained after the infringement had been committed, could have the retroactive effect, as against the party entitled to sue by reason of the infringement, of estoppel.

As clearly, Goodwin & Learned had no right to grant any license within the State of New Jeresy.

As clearly, the rights of the parties was settled by the interlocutory decree, and nothing which transpired after that could operate either as an estoppel

or as a release. The rights of the complainant then depended upon the decree, and not upon the patent. After such decree, there was nothing open for litigation. The rights of the complainant reposed on such judgment or decree, and not on the patent, and no transaction between Goodwin & Learned and Tubbs could affect such right (*Mevs* v. *Conover*, 11 *Off. Gaz.*, 1111).

XII.

The final decree in this case (p. 318) gave the plaintiff interest on the amount fixed by the decree as the amount of recovery, namely, on $74,992.16, from the 26th day of March, 1872, the date of the interlocutory decree. This provision in the decree was inserted upon the authority of the final decree entered by Judges McKenna and Nixon in the *New Jersey Zinc* case.

From the date of the interlocutory decree the defendants occupied the position of trustees for the plaintiff, and as such were accountable for interest on the trust fund, which they had wrongfully appropriated.

XIII.

The decree should be affirmed.

C. A. SEWARD,
B. WILLIAMSON,
For Plaintiff and Respondent.

APPENDIX.

U. S. Circuit Court.

DISTRICT OF NEW JERSEY.

THE AMERICAN NICOLSON PAVEMENT COMPANY

vs.

THE CITY OF ELIZABETH.

POINTS FOR THE PLAINTIFF,

On the Final Hearing before W. J. MAGIE, Esq., *Master.*

I.

It appears from the testimony for the complainant, used upon the final hearing (fol. 476), that upon the 17th November, 1869, the complainant caused a notice to be served upon the City of Elizabeth, calling its attention to the Nicolson patent, and stating that, in the complainant's judgment, the construction of the Brocklebank and Trainor pavement would be an infringement of the Nicolson patent, and of the complainant's rights thereunder.

On the 1st of December, 1869, the defendant

Tubbs, with one W. W. Crane, gave his bond to the City in fifteen thousand dollars, with the condition that, "Whereas, he had made a proposition to the City Council of the said City of Elizabeth for paving, etc., under the Brocklebank and Trainor patent: Now, the condition of this obligation is such, that if the said Tubbs & Crane shall fully indemnify and save the said City of Elizabeth harmless against all damages, suits, costs and charges that the said city may sustain on account of any alleged infringement of what is known as the Nicolson patent, or that may be recovered by the Nicolson Wood Paving Company, or by any other corporation, association, person or persons, in consequence of awarding the contract to said Tubbs, then this obligation to be void, otherwise, to remain in force."

It is apparent, therefore, that before any of the pavements in question were constructed, the defendants, the City of Elizabeth and George W. Tubbs, were advised of the claim of the plaintiff, that the Brocklebank and Trainor pavement was an infringement on the Nicolson patent.

Notwithstanding such advice, the defendant Tubbs saw fit to take the responsibility of the infringement, and to indemnify the City to the extent of fifteen thousand dollars.

He, therefore, as well as the City, acted advisedly, and with full knowledge of the claim of the complainant, and in such case the language of Mr. Justice Ingersoll, in *Sickles* vs. *Mitchell* (3 *Blatchf., C. C. R.*, 552), applies: "They have no one to blame but themselves." Their infringement was wanton.

II.

The defendants proceeding to construct the pavement, this suit was brought on the 29th April, 1870. It was brought, as appears by the bill, in the form then in vogue; and, having been brought before the Act of July 8, 1870, it did not pray, nor do the complainants now seek to recover, the damages which they have sustained in the legal acceptation of that term.

The Act of 1870 has been decided by Mr. Justice WOODRUFF (*Williams* vs. *Leonard*, 9 *Blatchf., C. C. R.*, 476) to have no application to suits brought before its passage.

The decree in this case provides, among other things, as follows:

"V.—That an account of the damages, or use and profits, be taken and stated by W. J. Magie, Esq., counsellor-at-law, residing at the City of Elizabeth, as Master of this Court *pro hac vice*.

"VI.—That the said plaintiff recover of the said defendants the damages, or use and profits, which shall be reported by the said Master, and that, upon the confirmation of his report, a decree be entered against the defendants therefor."

The words "damages" and "profits" are here used as convertible terms, and such, in fact, they are: for, as was said by Mr. Justice Strong, in the case of *Mowry* vs. *Whitney* (1 *Patent Office Gazette*, 492): "Though called profits, they are really damages." This question of the "damages" or "profits" is the only one referred to the Master, and the only one which he has been authorized to decide.

III.

Before proceeding to discuss the facts of the case, there are certain legal definitions of the words "damages" and "profits," to which it is proper to call attention. The distinction made in the Statute between damages and profits must be borne in mind. That distinction, as enforced by the Courts, is this: that damages are to be recovered in a suit at law by the verdict of a jury; that profits are to be recovered in a suit in equity, under an accounting, presided over by an officer of the Court. What are damages, and what are profits, have been the subject of many decisions, but the rule which they enunciate seems to be harmonious.

Where the patentee has been in the habit, not of manufacturing and selling himself, but simply of granting licenses for a stipulated fee, such fee, in an action at law against an infringer, is held to be the proper amount of damages. (*Penn* vs. *Jack*, 17 *Law Times R., N. S.*, 407; *Batten* vs. *Silliman*, 3 *Wallace, Jr., p.* 130.) But even in such case the rule is not imperative, and the patentee, in a proper case, may show actual damages beyond the license fee. (*Pitts* vs. *Hall*, 2 *Blatchf. C. C. R.*, 230.)

When it appears, however, that the profits accruing to the inventor, or his assignee, consists in the exclusive use of an invention, or in the monopoly of making it for others to use, the cases all agree that the rule as to profits is the amount which the infringer has made. The only advantage which the complainant derives under its license, in the present case, is the right of constructing, and therefore the benefit of the patent to it is the monopoly which it gives to it of the right to construct and sell the pave-

ment in the State of New Jersey. It is that monopoly which has been interfered with; and when that fact appears, the concurrent decisions are, upon the question of profit, that the plaintiff is entitled to recover what the infringer has made. This is so even at law.

In *McCormick* vs. *Seymour* (3 *Blatchf. C. C. R.*, 209) the Court said: "The patentee is entitled, as damages, to the profits he could have made in constructing and vending his machine, over and above the mere profits arising out of its manufacture.' In *Sickles* vs. *Borden* (*Id.* 543) the Court said: "If the patentee has an established price in the market for his patent right, or what is called a patent fee, that sum, with interest, constitutes the measure of damages. If the patentee has no established price as a patent fee, then you are to inquire as to the loss or injury which he has sustained by reason of the infringement, and the profits which the infringer has made by the use of the invention may be taken as the measure of damages. Of course the defendant cannot complain of that, because, if, in fact, he is an infringer, he has been using the property of the plaintiff."

A similar principle with regard to the rule as to damages was laid down in *Wintermute* vs. *Ludington* (1 *Fisher's Pat. Cases*, 252); *Paige* vs. *Ferry* (*Id.* 316); *Wilbur* vs. *Beecher* (2 *Blatchf.* 132); *Hall* vs. *Wilds* (*Id.* 201); *Tatham* vs. *Leroy* (*Id.* 474).

IV.

The difference between the rule as to what the patentee or his assignee is entitled to recover at law and in equity, is very well stated by Mr. Justice

Grier in *Livingston* vs. *Jones* (2 *Fisher*, 209). The Court said: "If the inventor's profit consists neither in the exclusive use of the thing invented, nor in the monopoly of making it for others to use, but in having the general nse of it by all who are willing to pay him the price of his license, then the nonpayment of the license fee by the infringer is the only wrong done to the patentee. The only cases in which the measure of the patentee's damage is the amount of the infringer's profit, are where the invention is of some new machine, or a new form of any kind of known machine, which, as a distinct species of machine or manufacture, is more valuable, or can be put into the market cheaper, so as to supersede or exclude other machines or manufactures of the same genus, and where the profit of the patentee consists in a complete monopoly of the right to make and vend the new machine or manufacture as a unit, and in the exclusion of all competition. In such a case the only measure of damages in a Court of Equity is the amount of profits made by the infringer; and it is in such case that the injured party should seek his remedy in a Court of Chancery, where he can have a decree for an account, and an injunction to protect his monopoly."

The injunction in this case has been granted. To what profits is the complainant entitled to on an account and a final decree?

We are not without authority upon this point.

In *Dean* vs. *Mason* (20 *Howard*, 203), the Supreme Court said: "The rule in such a case is the amount of profits received by the unlawful use of the machine. As this in general is the damage done to the owner of the patent, it takes away the motive of the infringer of patent rights, by requiring

him to pay the profits of his labor to the owner of the patent."

In *The Rubber Co.* vs. *Goodyear* (9 *Wallace*, 804), the same Court said:

"The Circuit Court decreed that the Providence Company was liable for all the 'profits made in violation of the rights of the complainants under the patent aforesaid by the respondents, by the manufacture, use, or sale of any of the articles named in said bill.' This was in accordance with the rule in equity cases established by this Court. The profits made in violation of the rights of the complainant, in this class of cases, within the meaning of the law, are to be computed and ascertained *by finding the difference between cost and yield.* In estimating the cost, the elements of *price of materials, interest, expenses of manufacture and sale, and other necessary expenditures, if there be any, and bad debts,* are to be taken into account, *and* usually *nothing else.* The calculation is to be made as a manufacturer calculates the profits of his business. 'Profit' is the gain made upon any business or investment when both the receipts and payments are taken into account. The rule is founded in reason and justice. It compensates one party and punishes the other. It makes the wrongdoer liable for actual, not possible, gains. *The controlling consideration is that he shall not profit by his wrong.* A more favorable rule would afford a premium to dishonesty and invite to aggression. *The Master 'refused to allow the extraordinary salaries which it appears by the books had been paid, being satisfied they were dividends of profits under another name, and put in that guise for concealment and delusion.' He refused to allow the profits due to elements not patented,* which entered into the composition of the

patented articles. The conduct of the defendants in this respect has not been such as to commend them to the favor of a Court of Equity. Under the circumstances, every doubt should be resolved against them. *The allowance was properly denied.*" * * * "*He refused to allow manufacturer's profits and interest on the* capital stock. *This was correct.*"

In *Carter* v. *Baker* (4 *Fisher*, 419) the Court said: "The profits made by the defendants in selling the machines are properly to be given; and if the right to make and vend the patented machine be the plaintiff's property, the profits resulting from the sale of it ought to belong to him."

In *Tilghman* v. *Mitchell* (*Id.*, 608) the Court said: "That the profits made by the defendant by his use of complainant's process, *together with the interest on said sums* from the dates when the saving was realized, &c. *I think that the plaintiff is entitled to interest.*"

In *Williams* v. *Leonard* (9 *Blatchf., C. C. R.*, 476) Judge Woodruff said: "As to the *salaries* of defendants during the period in which they have been engaged in infringing, *they have no title as against the complainant.* It would be a very great injustice if the quantum of gains and profits recoverable by the complainant depended upon the question of how much of such gains and profits the defendants used for their own support, or the support of their families, or, as even is more broadly claimed here by the defendants, how much they saw fit to appropriate to their own use. *Infringers would rarely be required to pay over anything if they could divide the gains and profits among themselves, under the names of salary, wages, or any other designation.* Men work for gains and profits;

but they are gains and profits still. Men support themselves and their families out of their gains and profits, but that does not change their nature. If it were not so, inventors might, by reason of infringement, fail to obtain anything, and the infringers obtain what they saw fit to term adequate salaries, out of their piracy. What, in *good faith, the defendants pay to others as expenses, may be taken as the cost to them of their manufacture. What they take to themselves are gains.* They might, perhaps, have earned and gained as much, or perhaps more, by labor in some other business, in no violation of the rights of their neighbor; but they cannot be permitted to gain either wages or salary by a violation of such rights."

In *Graham* v. *Mason* (1 *Patent Office Gazette*, 609) Judge Shepley said: "When the patentee is entitled to profits, *he is entitled to any profit the infringer has made* by the unlicensed use of the contrivance included in the monopoly."

In *Piper* v. *Brown* (3 *Id.*, 98) the same Judge said: "*It is not customary*, in estimating profits from an infringement, *to allow the infringing parties compensation for their own time and labor.* The Master's decision, rejecting the allowance of commissions, is sustained."

Now, with these general rules of law for our guidance, we are ready to approach the discussion of the evidence in the case, establishing the amount of profits which the defendants have actually received from the use of the Nicolson patent, and to which the plaintiff is entitled.

V.

Mr. ADAMS testified as to the price paid by the city of Elizabeth for the pavement which was laid by the plaintiff. That price was $4.50 per square yard. He further stated that of that sum $1.90 per square yard was profit to the plaintiff. We have, therefore, the argument to be founded upon comparison as to the profits which the defendants actually received from the construction of the six pavements which are particularly specified in the evidence herein.

Now, what did the defendants actually receive for the construction of the six pavements upon Garden Street, Grove Street, Newark Avenue, Sherman Avenue, North Avenue, and Grier Avenue? This is shown by Mr. MOORE (*folios* 325, 368) to have been $310,198.29.

Mr. MOORE also testifies that the whole number of yards laid on these different streets (*folio* 317) is $69,342\frac{8}{10}$ square yards.

Now, if the Nicolson Company had laid this number of yards, and made the profit thereon to which Mr. ADAMS testifies, of $1.90 per yard, the plaintiff would have received as a profit from the city of Elizabeth, for paving the six streets and avenues in question, the sum of $131,749.00.

The amount of money, to wit, $310,198.29, received by the defendants from the city, when divided between the $69,342\frac{8}{10}$ square yards, makes an average of about four dollars and a half per square yard, which is precisely the price which the city paid to the plaintiff for its pavement.

How much of this sum paid by the city was actual profit to the defendants?

Mr. MOORE answers this question very fully. He produces the ledger of the company, which contained an entry as follows: "Profit & Loss Cr.," and under this was a lead pencil footing, as follows: "$123,980.16." The details of this credit are found in Exhibit G, made for the purpose of this examination, which the books were not (*folio* 380).

Mr. MOORE was then asked (*folio* 332) this question:

"Do these entries show the profit to the company from the different pavements specified, over and above the actual cost, or disbursements to or of the company in laying these pavements; that is, what was paid for lumber, labor, and all materials or supplies used in constructing the pavement?"

He answered:

"They show the lumber, the material and labor actually put on the street for each job; that is, *they show profits, counting nothing else but what was actually spent upon the streets for paving, cleaning, &c.*"

So that we have the statement of Mr. MOORE that the entries under the head of Profit and Loss in the ledger show a gross profit to the defendants from their infringement of the plaintiff's patent of $123,980.16.

VI.

What, as matter of law or of fact, is properly to be deducted from this gross profit of $123,980.16?

So far as the facts are concerned as to what is proper to be deducted, Mr. MOORE states very explicitly. He was asked (*folio* 358) this question:

"Including the MACHINERY, what other items are

to be charged against the amounts shown in lead pencil figures on page 38 other than these, namely: ROYALTIES, COST OF PATENT, SALARIES, RENT, WOOD, ABATEMENT and DOCK, and including ASSESSMENTS IN PLAINFIELD?"

He answered as follows:

"*Including accounts in Plainfield, I believe that covers all.*"

Let us now take up these items which, in Mr. MOORE's judgment, are properly to be charged against this gross profit of $123,980.16.

AS TO THE MACHINERY.

Mr. TUBBS testifies (*folio* 264) as follows:

"The Company has now the machinery on hand, for which we charged $6,258.22, except some of the kettles, which have been sold, and the money credited."

Mr. MOORE testifies (*folio* 303) that the machine bills amount to $6,258.22; that what the Company sold amounted to $1,365.00; and that the balance makes the item of $4,893.22, which item reappears (*folio* 381) in Exhibit G at the same amount.

This item for machinery should be rejected from the account, for the reason that the defendants are yet in possession of the machinery, and there is no evidence of its deterioration, and having it in their possession undeteriorated, it is of the same value as it was when originally purchased, and is not, therefore, a proper entry to be made upon the debit side of the account, unless a corresponding entry is made upon the credit side, as would be made in taking an inventory of stock on hand. If so made, the one entry would balance the other, and the item would not reduce the amount of $123,980.16.

Mr. MOORE (*fol.* 358) concedes that only the loss on the machinery is to be charged to the debit of Profit and Loss. Inasmuch as no loss has been proved, there is no charge to be made, and therefore the item should appear on both sides of the account, or else not at all.

AS TO THE ROYALTIES.

These require but little explanation in order to show that they cannot be properly charged as a deduction from the gross profits.

Mr. MOORE testifies (*folio* 344), that the Company had no other source of revenue than under these contracts with the cities of Elizabeth and Plainfield. Therefore, whatever was paid out for royalties was paid out of the profits made by the Company, and expressed by this gross sum of $123,980.16. Therefore, again, this was a disbursement from the profits. Now, ordinarily, it may be conceded that where such a disbursement is honestly made, and goes elsewhere than among the infringers, the item for royalties is a proper charge upon the debit side of a profit and loss account. But there is a discrepancy as to the payment of this royalty.

Mr. TUBBS (*folio* 236) says that the royalty was 20 cents per square yard, and that it amounted to $13,868.56; and this is correct, as appears by a multiplication of $69{,}342\frac{8}{10}$ square yards by the number 20.

Mr. TUBBS also states as follows:

"This was actually paid, and appears on our books. *We paid it to Brocklebank & Trainor.*"

This same amount appears as "royalties" in Exhibit E, under the head of "Actual Cost." It does not appear at all in Exhibit G, which was the last

Exhibit produced by Mr. MOORE, as a proper charge to be made in such an account.

Mr. MOORE was right in rejecting it from this account, for he had testified (*folio* 348) that $729.80 of the $13,868.56 was paid to MICHAEL DOYLE, and that "the balance was paid to Captain TUBBS."

Captain TUBBS is a defendant here, and MICHAEL DOYLE appears (*folio* 240) to have been one of the directors of the company.

There is no known principle of law which authorizes one of the infringers to claim a portion of the profits made by an infringement as "royalties" due to himself, or which authorizes a director of an infringing company to claim a right to a portion of the infringing profits as a "royalty" due to him. The profits are profits, and cannot, under the rules of law, above quoted, be retained by the wrongdoers, under any guise.

The Master should, therefore, reject the item for royalties.

AS TO THE COST OF PATENT.

This is put down at $25,000.00, in both Exhibits E and G. It was paid out of the net profits. It appears (*folio* 396) that this was for one-quarter interest in the infringing patent of Brocklebank & Trainor, and that the one-quarter was paid after this suit was brought. Now, how was this $25,000.00 paid?

Mr. MOORE states (*folio* 308) that there was to be deducted from this sum $10,000.00 for the purpose of conducting this litigation; that, by an error, only $8,000.00 was deducted, and the balance, $17,000.00, was paid in cash.

Clearly, the defendants are not entitled to credit themselves in this suit with their expenses in defend-

ing it. *A fortiori* is this true, when the plaintiffs have no way of reimbursing themselves for the expenses of their side of the controversy. It would be a novel rule of law which permits an infringer to exhaust the profits of the infringement in conducting an unsuccessful defense. Therefore the $8,000.00 retained by the company, and paid to their counsel, must be rejected by the Master.

Now what became of the $17,000.00, the balance of $25,000.00? Mr. MOORE was asked (*folio* 345) this question: "To whom was the difference between the $8,000.00 and $10,000.00 on the $25,000.00 paid, for the one-quarter interest in the patent?" He answered: "There were two parties interested in it; it was paid to them—Captain TUBBS and ANDREW DUTCHER; whether there were any more interested or not I do not know."

He was further asked, "Did the company receive from Mr. TUBBS and Mr. DUTCHER an assignment of one-quarter interest in the patent?" And he answered: "Received it from Mr. TUBBS."

This is another attempt on the part of Mr. TUBBS to appropriate the profits of the company in an illegal way; and he cannot retain such portion under any guise. Nor can Mr. DUTCHER retain his proportion, for the reason that it appears (*folio* 239) that he was one of the directors of the defending company.

But this whole item of $25,000.00 is obnoxious to the further objection that it was paid out of the profits after they were earned, and is not a proper charge against the cost of the construction of the pavement in question. The one-quarter interest in the patent was not necessary for the construction of

the pavement in question, for that was laid under the license which is set out in the case (*folio* 422).

It is immaterial to the legal inquiry what the defendants did with the profits which they made. They might have invested them in stocks, or in lands, or in other patent rights; but whatever they did invest them in is not to be charged as a disbursement for the cost of constructing the pavement in question.

The Company yet owns this one-quarter interest. Suppose the $25,000.00 had been paid for United States bonds, and the Company yet held them, could it be said that it could retain those bonds and charge them as a disbursement against the pavement as an actual item of cost? If the defendants have chosen to affix the value of $25,000.00 to the patent they yet have, then it must credit the credit side of the profit and loss account with the patent right thus purchased, and such a credit would reject the item from the consideration of the Master.

AS TO THE SALARIES

This leads us to the inquiry as to the formation of the Company.

It appears (*folio* 312) that the charter of the Company was approved on the 17th of March, 1870.

Mr. TUBBS said (*folio* 242) that the capital stock was $250,000, and that there never was anything paid in, in money, by the stockholders.

He also states (*folio* 369) that only $145,000 was issued of this capital stock.

He further states (*folio* 242), "that the stock was issued as paid-up stock for the license under the Brocklebank & Trainor patent, which was owned by CRANE, myself and A. C. KELLOGG, under the

firm of CRANE, TUBBS & Co. The license covered New Jersey. I think all the stock was issued for the license."

This evidence of Captain TUBBS is verified by the production of the assignment of the license, which recites (*folio* 438) that it is "in consideration of the sum of $145,000, to them (the said CRANE, TUBBS & Co.) paid."

Now, what became of these 1,450 shares of stock?

Mr. TUBBS states that there were, including his own firm, thirteen directors. Ten shares were issued to each of the directors. CRANE, TUBBS & Co., being three of the directors, received their ten shares—the other ten directors receiving ten shares each, or one hundred shares in the aggregate. These one hundred shares, deducted from the 1,450 shares, leave 1,350 shares, which Mr. TUBBS says (*folio* 244) went to CRANE, TUBBS & Co.; and they remain there, so far as the evidence shows, to this day.

There were six contracts put in evidence by the plaintiff (*folio* 14) between the city of Elizabeth and the defendants. One of these contracts only was issued to the New Jersey Wood Paving Company. The other five were issued to the defendant TUBBS, and were assigned by him to the Company. Consequently such assignment must have been made after the date of the formation of the Company, March 17, 1870.

All the final certificates of the Street Commissioners, for laying the pavement in question, under the six contracts put in evidence, are dated prior to the 1st of December, 1870 (*folio* 18). It does not appear that the New Jersey Wood Paving Company were actually engaged in active operations at any other time than the interval between the date of the

formation of the Company, March 17, 1870, and the 1st of December, 1870, when the final certificates had all been allowed by the proper authorities. This is at most a period of eight months, during which the Company was engaged in the laying of pavements.

For these eight months Mr. TUBBS tells us *(folios* 258, 264) that there were paid for salaries $22,500.

Now, who received these salaries? CRANE, TUBBS & KELLOGG, owners of all the stock of the Company, save a hundred shares, and all directors in the Company.

How were these salaries voted? It appears (*folio* 418) that on the 28th of April, 1871, "Mr. A. C. KELLOGG appointed Mr. A. W. KELLOGG, E. S. ATWATER, and MICHAEL DOYLE, three of the directors, a committee to confer in regard to salaries of the officers of the Company from the time of the organization to the then present time, and for the future." The matter slept until February, 1872. The argument of this case commenced on the 31st of January, 1872. On the 3d of February, 1872, Messrs. A. W. KELLOGG, MICHAEL DOYLE, and E. S. ATWATER reported favorably on a bill of $14,000.00 for services to date, though they (the committee) only held thirty shares of stock in a company which had outstanding 1,450 shares. These men were but tools in the hands of CRANE, TUBBS & Co., and the vote of the salaries of $14,000.00 was a mere ruse to get a dividend, in apprehension of an adverse decision.

This $14,000.00 was increased by a further payment up to the 1st of February, 1873, of $8,500, making the sum total of $22,500.00 paid for salaries for officers of a company which was engaged in

active business only from the 17th of March, 1870, to the 1st of December of the same year.

Now, how was this salary paid? This is stated by Mr. Moore (*folio* 297):

CRANE, TUBBS & Co. borrowed money of the New Jersey Wood Paving Company, and gave their notes, which notes, divided into 1,450 equal parts, belonged, to the extent of 1,350 parts, to CRANE, TUBBS & Co., as makers. The form was gone through of surrendering these notes, in which only $\frac{100}{1450}$ parts were outstanding as evidences of debt against CRANE, TUBBS & Co.

The authorities above cited show that no such enormous sums can be diverted from the just grasp of the law under the guise of salary, wages, or any other name.

AS TO THE RENT.

This is stated at $6,000.00. What was it paid for? Mr. TUBBS says (*folio* 277):

"The parties to whom the rent was due received the money. CRANE, TUBBS & Co. received rent for the office on East Street, Elizabeth, and the lumber yard on the same street. I could not say when it commenced or when it ceased."

He states further (*folio* 281):

"I could not say how much rent CRANE, TUBBS & Co. received for the occupancy of either of those rooms, the two being 12 by 48 feet; I could not say how much has been charged for rent for the yards."

Rents, properly charged, is undoubtedly a proper item to be put upon the debit side of a profit and loss account; but when the landlords own $\frac{1350}{1450}$ of the stock, it is pretty plainly evident that this, too, was a ruse to divert the profits of the company into

the hands of those who owned the company, and so to deprive the plaintiff of the benefit thereof. The amount should be rejected.

As to Wood.

This is put in at $570.93. This is estimated, and there is no proof of any disbursement connected therewith (*folio* 298). The amount, therefore, should be rejected.

As to Abatements.

This is put in the exhibit as $15,241.33. There is no legal justification for this charge, especially as the major portion of it appears (*folio* 297) to have gone among the directors of the company, Mr. Dimock, Mr. Charles L. Doe, the partner of Mr. John Davidson, Mr. A. C. Kellogg, Crane, Tubbs & Co., and Mr. Dutcher. There are only two payments which were not dividends of profits, under another guise, and those are the items of $266.67 to Preston Graham, and $75.00 to Robert Westcott. Even these two items are to be rejected, for they are no proper charge as against the construction of the pavement. What the company chose to do with the profits which they made, is a question wholly immaterial to this investigation. What amount they realized is now the only pertinent inquiry. What subsequent disposition of that amount was made is a question not to be passed upon by the Master or the Court, for it is utterly irrelevant.

As to the Dock.

This is put down in the exhibit at $2,675.09. Mr. Moore purports to produce a voucher (*Exhibit F.*

folio 376) for this dock. The voucher does not support the payment by the company, but appears to have been a disbursement by CRANE, TUBBS & Co., who are still, so far as the evidence shows, in the possession of the dock, with the right to use it.

The voucher is also referred to by Mr. TUBBS (*folio* 270). He thinks there was a lease to the company, and says he will look for it. If there was, the value of that lease is to be credited upon the profit side of the account; and inasmuch as the defendants have not seen fit to give the proper credit, the debit is to be rejected.

AS TO THE ASSESSMENTS IN PLAINFIELD.

This is the last item which Mr. MOORE states is properly to be deducted from the gross profits of $129,980.16.

Now, how much is to be deducted for that? It appears (*folio* 315) that the pavement cost $10,878.47. The company have received therefor in cash $9,273.24, and for lumber returned $1,561.45; making, in the aggregate, $10,834,69. The difference between the two accounts is $43.78, which is properly to be deducted from the profits of the Company.

Therefore, the $123,980.16, with this deduction of $43.78, which leaves $123,936.38, is the amount for which the plaintiff is entitled to a decree against the defendants. To this amount interest should be added.

The plaintiff is entitled to a further decree against all the defendants, save the City of Elizabeth, for the royalty received from the City of Cohoes, testified to by Mr. MOORE (*folio* 316) as amounting to $1,260.58.

C. A. SEWARD,
Of Counsel for Plaintiff.

Circuit Court of the United States.

DISTRICT OF NEW JERSEY.

In Equity.

THE NICOLSON PAVEMENT COMPANY

vs.

THE CITY OF ELIZABETH *et al.*

SUPPLEMENTAL BRIEF FOR MASTER ON THE POINT, THAT THE PLAINTIFF COULD NOT HAVE LAID THE PAVEMENTS IN QUESTION.

1. *As to Garden and Grove Streets:*

The petition in relation to these streets is dated 11th February, 1870, more than a month prior to the formation of the Wood Paving Company. It asks for the awarding of the contract to Brocklebank & Trainor, and in accordance with proposals made by George W. Tubbs. It appears (fols. 47–48) that the contracts for paving Grove and Garden Streets were made with George W. Tubbs on the 20th April, 1870, and the contracts passed to the New Jersey Wood Paving Company.

The petitioners in this case are ANDREW DUTCHER and A. W. DIMMOCK, who are certified to represent a majority of the frontage of Grove and Garden Streets. Mr. DUTCHER and Mr. DIMMOCK were Directors of the Wood Paving Company, and received directly from the Company the abatement mentioned in the testimony.

2. *As to North Avenue:*

This petition is signed July 12, 1870, by JOHN DAVIDSON, CHARLES L. DOE, JOHN CLAY, JOHN A. NELSON, JACOB S. YOUNG, HENRY CLAY, PRESTON GRAHAM, WILLIAM W. CRANE and A. C. KELLOGG. Of these parties, Messrs. DOE, CRANE and KELLOGG were Directors of the Company, and Messrs. DOE, GRAHAM, A. C. KELLOGG and CRANE severally received a portion of the abatements shown in the testimony.

3. *As to Newark Avenue:*

The petition is signed, among others, by DOE, CRANE, TUBBS & CO., and JOHN DAVIDSON, the partner of DOE, all of whom were Directors of the Company, and received the abatements spoken of in the testimony.

4. *As to Grier Avenue:*

The petition is signed by Mr. A. W. DIMMOCK alone.

There is, therefore, nothing in these signatures which suggests such an unprejudiced, unbiased and unremunerated expression of opinion on the part of independent property holders, as requires the Court to hold, as matter of law, that the plaintiff could not have obtained proper legal authority and permission to have constructed the pavements in question. The testimony on final hearing (fol. 476)

shows that the plaintiff was a competitor with the New Jersey Wood Paving Company for the laying of this very pavement; and it appears from the testimony before the Master (fol. 29) that the plaintiff Company had laid its pavement in Elizabeth, and had also laid a portion of the Grier Avenue pavement, which was completed by the defendants.

The presumption therefore is, that but for the unwarrantable act of the defendants the plaintiff would have continued to have laid its pavement in the city of Elizabeth, and, among other streets, to have paved the very streets which are in controversy in this case.

But even if the plaintiff could not have secured the assent of the proper number of property owners, that fact forms no legal justification for the use of the plaintiff's patent by the defendants. If the defendants had been an individual, and had simply used the plaintiff's patent upon his own farm, in the construction of a roadway around it, he could not have defended an action for the infringement by asserting that the plaintiff could not have laid the same pavement upon the defendants' farm, and therefore the defendants ought not to pay for the infringement. This simple illustration shows the fallacy of any argument which may be attempted to be founded upon the purchased signatures of the property owners.

Again: The defendants, the NEW JERSEY WOOD PAVING CO. and TUBBS, were actively engaged in promoting this infringement by buying the land and obtaining the control of it, for the very purpose of laying out streets and avenues with this pavement (See Tubbs' testimony, Defts' Original Record, fol. 278). As owners of the land they gave consent to

the infringing pavement, and then as owners of the patent they made the profit.

Again: This question is not one of account. It is an affirmative defense, going to the merits. It concedes the infringement and the profits, and seeks to avoid their payment upon an independent ground, which is in nowise connected with the question of profit.

The Master therefore cannot consider it. It has not been referred to him. The decree adjudges the defendants liable to the plaintiff; and the Master cannot go behind the decree.

But again: This question has been already passed upon by the Court, and decided adversely to the defendants.

The point made is this:

Inasmuch as the plaintiffs did not get the written consent of the property owners, they could not have got it—a conclusion which by no means follows; and therefore they could have had no legal right to construct their pavement upon the streets in question.

In other words, if the plaintiffs had undertaken to lay their pavement, they would have been committing a legal trespass. Now, the question of the effect of this position of affairs has already been passed upon by the Court. The defendants set up in their answer that the pavement which they constructed was constructed under a patent which belonged to them. Conceding this, it follows necessarily that the plaintiff would have had no legal right to have constructed a pavement according to the defendants' patent, and yet, notwithstanding it had no legal right to commit a trespass upon the de-

fendants, by using their patent, the Court has held that the defendants were liable to the plaintiff.

Precisely the question, therefore, sought to be raised has been passed upon by the Court, and it is this: Whether, because the plaintiff was unable to do that which the defendants did, the defendants can use the plaintiff's patent without being responsible therefor? The Court has decided that this inability of the plaintiff forms no justification to the defendants, and the Master is concluded in that regard by the decree which adjudges that the defendants have infringed.

But the conclusion which the defendants seek to have drawn from the fact of the petitions is not warranted by the evidence; because it appears from the affidavits which were used on the part of the defendants in resisting the motion for the injunction, that the city of Elizabeth, before it awarded the contracts for paving the streets in question, advertised for proposals, and thus conceded that they had a right to select such form of pavement as they chose, and guarantee their ability, or the ability of those owning the pavements selected, to secure the desired signatures of property owners. This evidence will be found in the affidavit of Mr. TUBBS, herewith submitted.

C. A. SEWARD,
Of Counsel for Complainant.

AUGUST, 1873.

United States Circuit Court,

DISTRICT OF NEW JERSEY.

THE AMERICAN NICOLSON PAVEMENT COMPANY

against

THE CITY OF ELIZABETH *et al.*

Supplemental Points for the Plaintiff, on Exceptions by both parties to the Master's Report.

THE PLAINTIFF'S EXCEPTIONS.

I.

The plaintiff's First Exception is as follows:

> "For that the said Master erred in not excluding the evidence which it appears by the minutes thereof, annexed to the said report, was duly objected to, upon the grounds and for the reason in said minutes fully set forth."

The Court will recollect that an application was made to it, on notice served June 4, 1873, to strike from the record all the evidence which the plaintiff

objected to. Such application became an *ex parte* one, for the reason that the counsel for the defendants informed the Court by letter that he would not be able to attend, owing to his engagements elsewhere. The Court thereupon directed the application to strike out the evidence, to stand over until the coming in of the Master's report, saying that "the plaintiff would not be prejudiced by the postponement."

The order of reference to the Master is as follows:

> "That an account of the damages or use and profits be taken and stated; that the said plaintiff recover of the said defendants the damages, or use and profits, which shall be reported by the said Master."

The words "damages" and "profits" are here used as convertible terms, and such in fact they are. *Mowry* v. *Whitney* (1 *Pat. Off. Gaz.*, 492.) The only relevant evidence before the Master was, therefore, such as threw light upon the only question referred to him, viz., "the profits made by the defendants."

On the hearing before the Master the defendants called as witnesses MURPHY, SPENCER, SWEENEY, MILLIKEN, GREENE, REEVES, TRAVER, TITUS, DOYLE, STACKPOLE, JENKINS, and WHELAN, and sought to prove by them the mechanical construction of various wooden pavements, which had never been actually introduced into use, and the only description of which was to be found in the patents set up in the answer, and which were produced on the argument before the Court.

The defendants also sought to prove by these wit-

nesses that the Nicolson pavement, like every form of pavement, succumbed to traffic and the elements.

The plaintiff duly objected to the introduction of this evidence; but the Master admitted it, principally, as is supposed, for the reason that such is the practice prevailing in this Circuit, which does not give to the Master any right to pass upon the question of the admissibility of evidence, but requires him to take all the evidence offered by either party, leaving the question of its admissibility for the ultimate decision of the Court.

The question of the mechanical construction of the various forms of wooden pavements, described in the patents produced at the final hearing, had no relevancy before the Master. It had a relevancy upon the question of novelty when the case was before the Court, but upon the question of the amount of profits made by the defendants such evidence was totally irrelevant.

A suggestion was made apparently for the purpose of bringing the case, if possible, within the rulings of *Mowry vs. Whitney*. In that case the Court held, in substance, that, in estimating an infringer's profits, the question to be determined is, what advantage has he derived from using the patented process, over what he had in using other processes "*then open to the public, and adequate to enable him to obtain an equally beneficial result?*"

With regard to the pavements described in the English and French patents, there was no evidence that such pavements had ever been practically constructed, or that they could be usefully employed, or that if employed they would produce the same pavement as the Nicolson.

With regard to the pavements described in other

American patents, their use was not open to the public.

The defendants had made use of the plaintiff's form of pavement, which, upon the evidence, was the only one which had ever been successfully introduced into actual practical use. The evidence which was objected to did not, therefore, tend to bring the case within the facts as they existed in *Mowry vs. Whitney;* and it should have been excluded.

The fact that the Nicolson pavement wears out is utterly inconsequential upon the question of "profits." Every kind of pavement wears out; and so does every patented machine. All the evidence, therefore, with which the record is encumbered, upon the question of the durability of the Nicolson pavement, and as to the form of construction of other pavements, should be stricken out.

II.

The Second Exception is:

> "For that the said Master erred in his said report in allowing for losses arising from the impossibility in collecting the contract price of the Plainfield pavement, the sum of $3,388.35, such loss being of prospective profits only, and the actual loss on said Plainfield pavement having been proved to be $43.78, and not $3,388.35."

As to this item the Master says:

> "Laid in the city of Plainfield, under contract between said city and George W. Tubbs, or The New Jersey Wood Paving Company—square yards, 2,700."
>
> "For losses arising from the impossibility of

collecting the contract price of the Plainfield pavement, the sum of $3,388.35, which I find and allow, as a proper deduction from the gross profits."

The witness, MOORE, the bookkeeper of the defendants, was asked (*fol.* 315) to state the actual cost for materials and labor of the pavement constructed at Plainfield, and he answered as follows:

"$10,878.47 was the actual cost. The Company has not received the whole pay. They have received $9,273.24, and there should be a deduction for lumber not used in the job, though included in the above statement of cost, and which was returned, amounting to $1,561.45."

These two sums—first, of money received, and, second, of lumber returned—make an aggregate of $10,834.69, which is $43.78 only less than the actual cost. Therefore, this $43.78 is the only amount which should be deducted from the gross profits.

This witness further stated (*fol.* 322) that there was unpaid, which could not be collected, $3,388.35, and this is the sum allowed by the Master.

This sum does not represent any disbursement by the defendants other than the $43.78. It does represent what the authorities of Plainfield agreed to pay for the pavement laid there, and, therefore, it represents contingent profits, and not a loss upon such pavement as was actually laid (*fol.* 330).

A plaintiff is not entitled to recover contingent profits, and, by a parity of reasoning, a defendant is not entitled to deduct them as part of the cost of the infringing article. *Piper* v. *Brown* (3 *Pat. Off. Gaz.*, 98.)

III.

The Third Exception is:

"For that the said Master erred in his said report in allowing out of the gross profits made by the defendants herein for salaries of George W. Tubbs, William W. Crane and Augustus C. Kellogg, officers of the defendant, The New Jersey Wood Paving Company, as a reasonable compensation for one year, $7,000; because, as to the said salaries and said sum, the said officers and the said defendants have no title as against the said complainant."

The rule of law which rejects this allowance is to be found in the cases cited upon pages 6 and 7 of the printed Points for the plaintiff submitted before the Master. The emphatic language of Judge Woodruff would seem to be conclusive on this point.

The facts of the case, upon which this claim for salaries is based, will be found in the same Points, on page 15.

IV.

The Fourth Exception is:

"For that the said Master erred in his said report in allowing out of the gross profits made by the defendants herein, for an expense account not included in the cost of labor and material, $6,107.50, because there was no evidence before the said Master as to the constitution of such amount, or as to the nature of the application or expenditure thereof, or that the same was paid in good faith by the defendants to other persons for expenses."

The only place where these figures appear is at fol. 373, as follows:

"Expense account, $6,107.50."

This is in an exhibit produced by the witness Moore, and he does not give any evidence whatever as to how this sum was arrived at, and the Master has erroneously given the defendants credit therefor. The exception is well taken; for it does not appear by the evidence that that amount, or any portion of it, was paid in good faith by the defendants to other persons for expenses. The Master gives no reason in his report for adopting the amount.

V.

The Fifth Exception is:

"For that the said Master erred in his said report in allowing out of the gross profits made by the defendants herein, for an account called a loss and gain account, $156.76, because there was no evidence before the said Master as to the constitution of such amount, or as to the nature of the application or expenditure thereof, or that the same was paid in good faith by the defendants to other persons for expenses."

This amount of $156.76 does not appear in Exhibit E, which was made for the purposes of the accounting. It does appear in Exhibit G, but no evidence was taken in relation thereto, and it stands utterly undefended as a just expenditure.

VI.

The Sixth Exception is:

"For that the said Master erred in his said report in allowing out of the gross profits made by the defendants herein, $13,868.42 as a royalty or license fee for laying 69,342$\frac{8}{10}$ square yards of said pavement, under the Brocklebank and Trainor patent, because, as to said sum, the said defendants have no title as against the said complainant, and because the evidence before the said Master affirmatively showed that the same was not paid in good faith by the defendants to other persons for expenses."

This item does not appear in Exhibit G, which contains a profit and loss account. The reasons why this royalty should not be charged against the plaintiff are stated on pages 12 and 13 in the Points presented to the Master, and the exeeption is well taken.

THE DEFENDANTS' EXCEPTIONS.

I.

The defendants' First Exception is:

"The Master erred in refusing to find that the defendants were entitled to set off $31,-611.92 against any profit which he might find that the defendants ought to account for herein."

This exception is not well taken, for it is upon its face unintelligible, and does not conform to the rule

laid down in *Greene v. Bishop* (1 *Clifford*, 186), that the exceptions "should be so framed as not merely to allege error in general terms, but should indicate the particulars in which the error consists, and point out in what manner the alleged error arose."

If the exception is in sufficient form, then it is not well taken.

The supposed intent of the exception is to allow the defendants the benefit of what is called "a manufacturer's profit." How the sum stated in the exception was arrived at was shown by the witness TUBBS (*fol.* 228): "We charge a profit on the lumber, being about 15 per cent. For the tar (*fol.* 229) we charged 45 to 50 cents per barrel above its price; for the oil, 50 cents per barrel above cost; for the pitch, $5 above cost per 2,000 pounds. For the horses and men we charged a small profit—I think 10 per cent. For the machine work we charged a profit of 10 per cent."

It was for these additions to the actual expenditures of the defendants that the claim was made before the Master for the manufacturer's profits.

The cases cited upon pages 6 and 7 of the Points submitted before the Master, are conclusive upon the point that manufacturer's profits are not to be allowed; and this is stated to be the rule in *Curtis on Patents*, *4th Ed.*, § 436.

There is no rule of law which permits a party whose sole business is that of manufacturing and selling an infringing article at an agreed price, paid on delivery, to deduct, when sued as an infringer, from the profits which he has made, a profit or advance upon the elements which composed the infringing article. In the language of all the cases and of *Curtis on Patents*, "Profits are rightly esti-

mated by finding the difference between the cost and sales. In estimating cost, the elements of cost of materials, interest, expense of manufacture and sale, and bad debts, considered by a manufacturer in estimating his profits, are to be taken into account, and no others. Interest on capital stock and manufacturer's profits are not to be allowed."

If any such allowance can be made as is claimed under this exception, no good reason can be perceived why TUBBS could not have charged a larger profit so as to have embraced the whole of the difference between the cost of the pavement and the price paid therefor. There is no reason for limiting this charge to "10 per cent," or "50 cents on a barrel," or "$5 on 2,000 pounds." It might as well have been made sufficiently large to have embraced every dollar paid on the construction of the pavement. It could have been sworn to with as much propriety as the percentage already sworn to, and if 10 per cent. can be charged, no good reason is perceived why 20 cannot be; and if 20 had been, and the Master had adopted the defendants' views, he would have reported that no profits had been made. Surely the law is something more than a mere mockery.

This is not like the case of a steam engine, or a sewing machine, to which some slight improvement is added, and where the attempt has sometimes been made, and justly overruled, to collect the entire profits of the engine or the sewing machine; but it is the case of the entire adaptation of the plaintiff's invention, to which a claimed improvement has been added. The thing which the defendants infringed was the plaintiff's invention, without which their alleged improvements would have been useless. They

could not have made a pavement which would have been successful without the use of the plaintiff's invention, and, therefore, the profits which they have made are solely derivable from the use of the plaintiff's invention.

II.

The defendants' Second Exception is:

"That the Master erred in not finding the sum of $14,000, as salary to the persons named in the third paragraph of his report, instead of $7,000."

This has been already considered under the plaintiff's Third Exception.

III.

The defendants' Third Exception is:

"The Master erred in not allowing $6,000 as rent, instead of $3,000."

This exception was sufficiently answered in the Points before the Master, on page 18.

IV.

The defendants' Fourth Exception is:

"The Master erred in not allowing the defendants the sum of $2,670.90 on account of the dock, as claimed by them."

This was rejected by the Master, probably for the reasons assigned on page 19 of the printed Points.

V.

The defendants' Fifth Exception is:

"The Master erred in not allowing the defendants $25,000, paid by defendants for the Brocklebank & Trainor patent."

This was probably rejected by the Master, for the reasons stated on pages 13, 14, and 15 of the printed Points.

VI.

The defendants' Sixth Exception is:

"The Master erred in not allowing the defendants the sum of $6,572.75, named in the twelfth paragraph of the Master's report."

This sum of $6,572.75 did not enter into Exhibit G on the credit side of the account, which foots up $123,980.16. It did not enter into the lead pencil footings of the profit and loss account (*fol.* 340) of $123,980.16. It did not enter into the amount given by the witness MOORE (*fol.* 325), from the books of the Company, of "the exact amount of money paid by the city of Elizabeth to The New Jersey Wood Paving Company, for the construction of the pavements in question, which was $310,121.29," and which amount was subsequently corrected by the witness (*fol.* 368), as $310,198.29, and which latter amount was adopted by the Master in his report, as evidencing all the moneys which came from the city to the other defendants for the construction of the pavements in question. What propriety there is in deducting from this amount the sum of $6,572.75, does not appear.

The witness MOORE testified (*fol.* 363), that this amount "represents the profits of the Company made in other work done than the laying of the pavements in this case." For such other work the defendants received from other parties their pay; and they therefore received the very profits which they are now seeking to charge against the plaintiff. If the profits were received from other work than the construction of the pavements in question, then they were not properly chargeable in the account before the Master. If they are to be charged as against the plaintiff, the account of the Master should be increased by showing the receipt by the defendants of an equal amount; and, when so credited, the account would stand precisely as it does now, because the credit would precisely balance the debit.

VII.

The defendants' Seventh Exception is:

> "The Master erred in not allowing the defendant the sum of $15,241.33, paid out by them to stockholders and others, as mentioned in the fourteenth paragraph of the Master's report."

This was probably rejected by the Master for the reasons assigned on pages 6, 7, and 19 of the printed Points.

VIII.

The defendants' Eighth Exception is:

> "The Master erred in finding that any profits were due from defendants to complainant herein."

This exception is not well taken, because it is unintelligible, and because if the Master had acted in accordance therewith he would have violated the trust reposed in him by the Court.

IX.

The defendants' Ninth Exception is:

> "The Master erred in allowing interest upon the profits found by him."

The case of *Mowry* v. *Whitney* does not decide that interest is not allowable in a proper case. The language of the opinion is: "Interest is not generally allowable upon unliquidated damages. We will not say that in no possible case can interest be allowed. It is enough that the case in hand does not justify such an allowance."

This opens the door to a discussion of the question of what constitutes a proper case for an allowance of interest. In discussing that question, the facts in this case should be borne in mind, which establish—

(1.) That the defendants were notified, before they commenced the construction of the pavements in question in this case, of the claim of the plaintiffs. Their infringement, therefore, was wanton.

(2.) That in similar cases interest has been allowed. *Tatham* v. *Lowber* (4 *Blatch., C. C. R.*, 87.) *Tilghman* v. *Mitchell* (4 Fisher, 608.)

(3.) That the defendants received interest upon the principal sum paid by the City. That principal sum the Master has found to be

$310,198.29. Warrants were issued for this sum, commencing May 2, 1870, and ending December 7, 1870. (*Fols.* 52–60.) These warrants were paid in bonds, upon which, of course, as upon all bonds, there were interest warrants.

The defendants have therefore been in possession of the $310,198.29 since December 7, 1870, with interest accumulating thereon; and so much of that principal sum as belongs to the plaintiff was held by the defendants in trust, and bears with it, in equity, its proportion of increment.

This case, therefore, within the case of *Mowry* v. *Whitney*, justifies an allowance of interest.

(4.) Interest is in the discretion of a jury when assessing the damages (*Lincoln* v. *Claflin*, 7 *Wall.*, 132). No good reason is perceived why it is not in the discretion of the Court, when assessing profits, which, as the Supreme Court has said, are "unliquidated damages."

X.

The defendants' Tenth Exception is:

> "The Master erred in not ruling that all the profits due to any patented improvement in the pavements in question were due to the Brocklebank and Trainor patent; and that no profits had accrued from the Nicolson patent."

This exception is not well taken; because it assigns no reason for the error which it alleges, and

therefore contains no information, either to the Court or to the plaintiff, as to the grounds upon which the same is based.

The Master could not have ruled in accordance with the exception without violating his duty. He gave to the Brocklebank and Trainor patent all the credit to which it was entitled, when he allowed for the use thereof the royalty paid thereunder of $13,868.42.

But upon this point it should be recollected that the plaintiff was itself engaged in laying the Nicolson pavement in the city of Elizabeth at the very time when the defendants were laying their infringing pavement. The price paid by the City was the same in both instances, viz., $4.50 per yard. It is, therefore, conclusively established, that the City did not pay any more in consequence of the Brocklebank and Trainor alleged improvement than it was willing to pay, and was paying, for the Nicolson pavement without the alleged improvement. With what propriety, then, can the Court be asked to hold that the payment by the City of the $4.50 per square yard to the defendants was solely on account of the Brocklebank and Trainor alleged improvement?

But, again: If the exception means that the Master should allow a portion of the profits to both, then the answer to such suggestion is two-fold: *First*, he has allowed to the defendants' patent, 15 cents per square yard; and, *secondly*, the defendants did not show what proportion of the $4.50 paid by the City was paid in consequence of the change in the form of the pavement from the Nicolson to the Brocklebank and Trainor. The burden of proof was upon the defendants to show this; and not

having shown it, they could not ask the Master to arrive at it by the exercise of judgment. *Carter* v. *Baker* (1 *Sawyer*, 513).

XI.

The defendants' Eleventh Exception is:

> "The Master erred in not ruling that, if the plaintiff was entitled to recover anything except nominal damages, then that it is entitled only to recover 15 cents per yard, according to the contracts, Exhibits A and B."

If Exhibits A and B are the title-papers of the plaintiff, then the amount named in the exception is erroneous, because the license fee therein stipulated to be paid to the owners of the patent is sixteen cents per square yard.

In an accounting in equity, as in a suit at law, the amount paid by the licensee for an exclusive license under a patent has never yet entered into the computation of either profits or damages. The only case in which a license fee becomes of any moment is where the patentee has been in the habit not of manufacturing and selling, but merely of granting licenses for a stipulated fee. Such fee in an action at law is sometimes held to be his proper measure of damages; but where the profit of the patentee consists in the monopoly to make and vend the new machine or manufacture as a unit, and in the exclusion of all competition, then the patentee becomes entitled to the amount of profits made by the infringer.

The cases under this head are cited under the Third Point of the printed Points submitted to the Master.

XII.

The defendants' Twelfth Exception is:

> "The Master erred in not ruling that, upon the evidence before him, and the Statutes of New Jersey, no other pavement than the Brocklebank & Trainor pavement could have been lawfully laid on the streets and avenues where they were laid; and that, therefore, the plaintiff ought to recover only a nominal amount herein."

The *reductio ad absurdum* demonstrates that this exception is not well taken. It amounts to this: If A chooses to use B's patented machine in his (A's) house, where B has no right to go to erect a machine without committing a trespass, B cannot recover.

This is too absurd to need argument.

The plaintiff's exceptions should be sustained, and those of the defendants should be overruled.

C. A. SEWARD,
B. WILLIAMSON,
Of Counsel for Plaintiff.

AN ACT

To Revise and Amend the Charter of the City of Elizabeth.

* * * * * *

123. And be it enacted, That all contracts for doing work or furnishing materials for any improvement provided under this Act, exceeding in amount one hundred dollars, shall be advertised for three weeks in a newspaper printed, published, or circulating in said city, and shall at all times be given to the lowest bidder, he or they giving ample and satisfactory security for doing the same according to contract.

* * * * * *

Approved March 4th, 1863.

SUPPLEMENT TO AN ACT

Entitled "An Act to Revise and Amend the Charter of the City of Elizabeth," approved March Fourth, Eighteen hundred and sixty-three.

1. Be it enacted by the Senate and General Assembly of the State of New Jersey, That whenever the City Council of the said city shall determine to cause any improvement to be made which shall contemplate the use of any patented process or materials, and the owners of one-half of the property in running feet along the line of the intended improvement shall remonstrate, in writing, against the use of any specified patent, or petition for the use of any specified patent, or for the use of

one of two or more specified patents, in making such improvement, the said City Council shall award the contract for the said work only in accordance with the request of such proportion of owners.

2. And be it enacted, That it shall be the duty of the Mayor, before signing any contract for such work, to ascertain if such contract has been so awarded, and if not, to return the same to the said City Council unsigned, with his reasons therefor, whereupon the said City Council shall proceed to reconsider their action, and award the contract in accordance with the provisions of this Act.

3. And be it enacted, That this Act shall take effect immediately.

Approved February 9, 1870.

AN ACT

To Incorporate the New Jersey Wood Paving Company.

1. Be it enacted by the Senate and General Assembly of the State of New Jersey, That William W. Crane, Benjamin Williamson, James S. Green, George W. Tubbs, Anthony W. Dimmock, Augustus C. Kellogg, Amos Clark, Junior, Andrew Dutcher, Aaron Woodruff Kellogg, John Davidson, Edward G. Brown, and Archibald S. Woodruff, and all other persons who shall become subscribers to the capital stock according to the mode hereinafter prescribed, and their successors, be, and they are hereby created

a body politic and corporate, in fact and in law, by the name of "The New Jersey Wood Paving Company," for the purpose of constructing and laying wood and other pavements in the State of New Jersey, and for that purpose may manufacture or purchase all materials to be used in the construction or laying of the same, also all patents or patent rights the said company may deem of advantage to its business, and shall have power to secure all debts that may become due to said company.

2. And be it enacted, That the capital stock of said company shall be two hundred and fifty thousand dollars, to be divided into shares of one hundred dollars each, which stocks shall be transferable according to the by-laws of the said company, and shall be considered personal property, and the said company shall not commence business until ten thousand dollars of the capital stock shall have been subscribed and paid in in cash.

3. And be it enacted, That the persons above named shall constitute a board of directors, who shall manage the business of the company, all of whom shall be stockholders, one of whom shall be president, seven of whom shall reside in the State, and shall hold their office one year, and until others are elected in their stead; and an election of directors shall be held yearly at such time and place, and upon such notice, as the by-laws shall direct, at which election each stockholder shall be entitled to one vote, either in person or by proxy, for every share of stock by him or her respectively owned; and all vacancies in the board of directors may be filled for the unexpired term by appointment, to be made by the remaining directors.

4. And be it enacted, That said directors shall have power, on behalf of said company, to receive any property, patent or patent rights suitable for the purposes of the company at a valuation to be agreed upon, and in lieu of cash subscriptions, and shall have authority from time to time to open books for further subscriptions until the whole capital stock is taken; and the directors may call on the subscribers for the payment of installments, in such sums and at such times, and under such forfeiture, as they may deem expedient.

5. And be it enacted, That the directors shall have power to make by-laws for the management and government of said corporation, and may appoint such subordinate officers as the business of said corporation may require.

6. And be it enacted, That transfer books of said corporation shall be kept in the office of the said company in the city of Elizabeth, and shall be open to the inspection of the officers and stockholders thereof at all reasonable times.

7. And be it enacted that this Act shall take effect immediately.

Approved March 17, 1870.

At a Term of the Circuit Court of the United States for the Northern District of New York, held at the Court House in the Village of Canandaigua, on the 28th day of June, 1853.

Present—The Hon. SAMUEL NELSON and NATHAN K. HALL, *Judges.*

THE TROY IRON AND NAIL FACTORY
vs.
ERASTUS CORNING, JAMES HORNER and JOHN F. WINSLOW.
In Equity.

* * * * * * * *

And it is further adjudged and decreed, that the said defendants have infringed and violated the said patent so granted to the said HENRY BURDEN, as aforesaid, by making and vending the said hook-headed spikes by the said machinery patented to the said BURDEN, on 2d September, as aforesaid.

And it is further adjudged and decreed that the said defendants do account to the said complainants for the damages or use and profits in consequence of the said infringement by the said defendants.

And it is further adjudged and decreed that an account of the damages or use and profits be taken and stated by MARCIUS T. REYNOLDS, Esq., Counsellor-at-law, as Master of this Court, *pro hac vice*, and that the defendants attend before the said

Master from time to time, under the direction of the said Master, and that the said complainants may examine the said defendants under oath as to the several matters pending on the said reference, and that the said defendants produce before the said Master, upon oath, all such deeds, books, papers and writings as the said Master shall direct, in their custody or under their control, relaing to said matters which shall be pending before said Master.

And it is further ordered and decreed that a perpetual injunction issue out of, and under the seal of, this Court, against the said defendants, commanding them, their attorneys, agents and workmen, to desist and refrain from making, using or vending any machine containing the new and useful improvement for which Letters Patent were granted to the said HENRY BURDEN, on the second day of September, 1840, and from in any manner infringing or violating any of the rights or privileges granted or secured by said patent.

And it is further ordered that the said complainants recover of the said defendants the damages or use and profits which shall be reported by the said Master, and that, upon the confirmation of his report, a decree be entered against the defendants therefor, and also for the costs of the complainants in this suit in this Court; and that the said complainants have execution therefor, and for the costs in the said Supreme Court.

For the Court.

U. S. Supreme Court.

THE AMERICAN NICOLSON PAVEMENT COMPANY

vs.

THE CITY OF ELIZABETH *et al.*

Suggestions in answer to the printed Briefs filed on the part of the Appellants.

I.

The appellants present in their briefs certain arguments in relation to the findings of the Master with reference to the pavement laid in Plainfield and on Sherman Avenue, and to the findings against the defendant Tubbs and the city of Elizabeth. It is sufficient, in answer to these suggestions, to say, that no foundation was laid for such argument by the appellants in their management of the case in the Court below.

Rule 83 provides when and how the exceptions to the report of a Master must be made. This rule

was enacted for the purpose of saving time, and of giving the Master an opportunity for correcting error, if such exists, and the Court below an opportunity of passing upon the points thus presented. This rule was not observed in this case, and neither the attention of the Master nor of the Court below was called to such alleged errors, and neither the Master nor the Circuit Court had an opportunity to pass upon the same, or to correct them if they existed.

This Court, therefore, will not, in accordance with its well-settled practice, regard an argument founded upon such alleged error.

The rule was clearly stated by Mr. Justice CLIFFORD, in the case of *Green* vs. *Bishop* (1 *Cliff.*, 186), citing in his opinion the case of *Story* v. *Livingston* (13 *Peters*, 366), the head-note of which is as follows :

"Strictly, in chancery practice, though it is different in some of the States of the Union, no exceptions to a Master's Report can be made which were not taken before the Master, the object being to save time, and to give him an opportunity to correct his errors, or to reconsider his opinion. A party neglecting to bring in exceptions before the Master, cannot afterwards except to the report unless the Court on motion see reason to be dissatisfied with the report, and refer it to the Master to re-examine it, with liberty to the party to make objections to it. Exceptions to the report of a Master must state article by article the parts of the report which are intended to be excepted to. Exceptions to the report of a Master in Chancery proceedings are in the nature of a special demurrer, and the party objecting must point out the errors, otherwise the parts not excepted to will be taken as admitted."

And such was the rule as long ago as *Wilkes* v. *Rogers*, 6 *Johns.*, 592.

The appellants seem to seek to secure for themselves the position of having been injured by the action of the Court below with reference to their petition for a rehearing, for they say (p. 6 of their yellow-covered Brief) as follows:

"Upon the coming in of this report, numerous exceptions were made, and a petition for a rehearing *was presented, and refused;*"

seeking to create the impression that these exceptions were raised by a petition for a rehearing, which was brought to the attention of the Court, argued and denied.

A petition for a rehearing was filed on December 3, 1872, some ten months after the interlocutory decree, which was on March 26, 1872. Such petition for a rehearing was never brought to the attention of the Court, was never argued before it, and was never passed upon by it.

II.

As to Tubbs:

The allegation is, that he derived no personal benefit from the infringement, and therefore that the judgment against him is erroneous.

This is not well founded.

Tubbs was one of the firm of Crane, Tubbs & Co. That firm received the $145,000 of the stock of the

New Jersey Wood Paving Company. They also received $22,500 for salaries, $6,000 for rent, $2,278.89 for abatements, $2,675.09 for a dock, and $13,868.42 for royalties, making $47,322.40 out of the very profits of the infringement.

III.

Plainfield

As to the ~~plaintiff~~'s pavement:

An effort is made to convey the impression (*Brief, p.* 5) that the Master awarded against the defendants the profits which the defendants as a whole did not make, but which had accrued to certain of them from laying an infringing pavement "in the city of Plainfield, ten miles away, and in an adjoining township entirely beyond the city limits."

This is illusory.

It appears that the Plainfield pavement produced a loss of $3,388.35 (*Record, p.* 293), which amount the Master deducted from the moneys paid for laying the pavement in the city of Elizabeth.

The contract price for laying such Plainfield pavement was $14,223.04. The pavement cost (*Record, p.* 248) $10,878.47. The Master appears to have deducted one sum from the other, and charged the deficit against the general profits made by laying the pavement in the city of Elizabeth. This was apparently justified by the statement of the witness Tubbs (*Record, pp.* 248–9), who said, "There is unpaid $3,388.35, which cannot be collected."

IV.

As to Sherman Avenue:

The suggestion is attempted to be made that in this pavement the city of Elizabeth was not interested, and paid nothing therefor, and that the other defendants received nothing from the city on account thereof.

This also would seem to be illusory.

Tubbs said (*Record*, p. 249) as follows:

"Q. Can you state from the books of the company or otherwise the exact amount of money paid by the city of Elizabeth to the New Jersey Wood Paving Company for the construction of the pavements to which you have already referred?

A. I have got it in detail. Garden Street, $29,-260. Grove Street, $16,449.10. Newark Ayenue, $153,522.77. *Sherman Avenue*, $27,214.27."

It appears (*Record*, *p.* 293) that Sherman Avenue lay both within and without the corporate limits of the city of Elizabeth; that within the city there were laid 4,958$\frac{1}{10}$ yards, and without the city 5,003 yards, which were paid for in lands inventoried at the contract price of $22,-513.50, which lands the Master finds would not produce if sold (*Record*, p. 294) "more than at the rate of $3.50 per square yard,"—and he further allowed, as a proper deduction from such profits, the sum of $5,003, being at the rate of $1 for each square yard. This, deducted from the $22,513.50, leaves $17,510.50 as the actual sum received from laying the pavement beyond the city limits of Elizabeth. How much of this $17,510.50 was actual profit does not appear, for the appellants did

not prove before the Master how much it cost them to pave the extension of Sherman Avenue as contradistinguished from the whole of Sherman Avenue. If any error has arisen, it is due to their own neglect to print in the proper proof and to call the attention of the Master thereto. The burden of proof was upon the appellants to show that there was a distinction between the sum received from the city of Elizabeth and the proceeds of the lands, and how much profit accrued from the proceeds of the lands at the reduced profits stated by the Master; and not having proved these facts, they cannot now here, for the first time, complain of an injury in respect thereto.

It is further to be noted, that in regard to this extension of Sherman Avenue, that the defendants below imported it and all reference thereto into the case, and the plaintiff limited its original enquiry to the 64,339$\frac{9}{10}$ square yards laid in the city of Elizabeth. If, by reason of this addition of the 5,003 yards laid on the extension of Sherman Avenue, the defendants were injured, it was their own fault in importing the fact into the case, and in not calling the attention of the Master to any deduction which was proper to be made in consequence thereof.

The Master finds the net profits made by the defendants to have been $1.92 per square yard. The payment for the Sherman Avenue extension was in lands apparently at par. The Master finds (p. 294) that the lands were not worth par, or the price at which they were taken, and he therefore says: "I allow, as a deduction *from said profits*, the sum of

$5,003, being at the rate of one dollar for each square yard of said work." Deducting this $1 from the $1.92 of net profit leaves 92 cents per square yard, which, multiplied by the 5,003 square yards, gives $4,608.76 as the total allowed for the profit on the Sherman Avenue pavement without the city limits. This $4,608.76 was interjected into the case by the defendants, and cannot now for the first time be alleged in error.

V.

To what were the plaintiffs entitled?

A distinction is sought to be made between "damages" and "profits," as though there was something in one or the other of the two words which was controlling in a given case. If any such distinction ever existed it would appear to have been finally set at rest by the case of *Mowrey* v. *Whitney* (14 *Wall.*, 653), where this Court said:

"The profits which are recoverable against an infringer of a patent are in fact a compensation for the injury the patentee has sustained from the invasion of his right. They are the measure of his damages. Though not profits they are really damages, and unliquidated until the decree is made."

This was quoted with approbation by this Court in *Littlefield* v. *Perry*, 21 *Wall.*, 228–9.

In *Dean* v. *Mason*, 20 *Howard*, 203, this Court said:

"The rule in such a case is the amount of profits received from the unlawful use of the machine. As

this in general is the damage done to the owner of the patent, it takes away the motive of the infringer of patent rights by requiring him to pay the profits of his labor to the owner of the patent."

The same idea, in different language, was asserted in *Mowrey* v. *Whitney, supra :*

"What advantage did the defendant derive from using the complainant's invention over what he had in using other processes then open to the public, and adequate to enable him to obtain an equally beneficial result? The fruits of that advantage are his profits."

And then this Court, in *Littlefield* v. *Perry, supra,* added: "*For such profits he is compelled to account as damages.*"

Assuming that the Brocklebank & Trainor pavement was an infringement of the Nicolson patent, the computation of the amount of profits by the defendants is comparatively easy.

Where A. and B. are both engaged in similar business, ard are using therein an identical device, apparatus or process, the profit which A. makes is a *prima facie* guide in determining the profits which B. makes.

Here the plaintiff and defendants were both engaged in laying wooden pavements in the same city, under the same employer, out of identically the same materials. The plaintiff received, as its compensation for its pavement, $4.50 per square yard, and it made thereon a profit of $1.90 per yard, and it proved that amount as its damage. The defendants received for their pavement $4.50 per square yard, and they made a profit thereon of $1.92

per yard. Here, then, the profit is substantially equal, and the measure of the plaintiff's damage affords the measure of the defendants' profits. In any event, inasmuch as the plaintiff was making $1.90 per square yard on its pavement, every square yard that it was prevented from laying by the acts of the defendants was a positive and absolute damage to the plaintiff of $1.90.

Therefore, if damages be the test, then the plaintiff has sustained damages to the full amount reported by the Master. If profits be the test, then the defendants have made the full amount reported by the Master.

Complaint is made of the manner in which the Master computed these profits, viz.: that he took the cost and then found the yield. This was the only proper way in which to take and state the account.

In *Curtis on Patents*, § 43, the rule is stated as follows: "Profits are rightly estimated by finding the difference between cost and sales."

In *Rubber Co.* v. *Goodyear* (9 *Wall.*, 804), this Court said:

> "The profits made in violation of the rights of the complainant in this class of cases, within the meaning of the law, are to be computed and ascertained by finding the difference between cost and yield."

This is precisely what the Master did in this case. He found all the moneys that the defendants had paid out, and he deducted that from all the moneys which they had received, and no proof was brought by them to show that the deductions were not sufficiently ample to cover every possible form of expenditure which the infringing pavement had occasioned.

VI.

A suggestion is attempted to be made that the Brocklebank & Trainor patent was for a new pavement, as contradistinguished from an improvement on pre-existing pavements.

This also is illusory.

The Brocklebank & Trainor patent was intended to remedy an alleged defect in the Nicolson, and therefore involved the use of the Nicolson with the alleged defect remedied. This defect is purely imaginary, for Mr. Renwick testified, and the evidence was not disputed, that instead of the Nicolson strip working up as was alleged, the blocks wore down to the strip.

The assertion that the Brocklebank & Trainor form of pavement distributes the weight over a greater surface of the foundation, has no existence as a mechanical fact. It is purely theoretical.

The defect was imaginary. Brocklebank and Trainor were originally interested under the Nicolson patent, and while so interested they gave their depositions in favor of its absolute value, and of its great superiority over any other known form of pavement. They did this to procure an extension, in which extension Brocklebank was to have an interest. Brocklebank (*Record*, *p.* 164) said as follows:

"I commenced with the first block of Nicolson pavement which was laid in this city. I was interested in the Nicolson pavement from its first introduction into this city until March, 1869. * * * *X-Q.* 14. Did you acquire an interest of any kind in the Nicolson patent? *A.* I was to have had an interest, but got chiselled out of it."

Having thus been chiselled out of it, Mr. Brocklebank continues (*Record, p.* 165):

"Mr. Trainor and I had frequent conversations during the season the Nicolson pavement was being laid in Mercer Street, in the City of New York, on the means or mode of getting a better support at the base, to meet this weakness in the Nicolson pavement. I had formed a plan of giving a support by throwing a transverse planking, upon which the blocks could rest."

Trainor said (*Record, p.* 170):

"I had been accustomed to examine the Nicolson pavement. I have made wooden pavements a study for more than eight years, and have done as much, if not more, than any other man connected with the Nicolson pavement up to 1868. The defect we found in the Nicolson pavement was the working up of the strip, which we tried to overcome by nailing every strip. We commenced, *i. e.* Brocklebank and myself, to talk about it, I think, in the latter part of September, 1867. I told him in the course of our conversations that there were only two defects to overcome in the Nicolson pavement. One was to strengthen the foundation and also to protect the wood from perishing. We then for a year consulted off and on, compared notes and experimented on different methods to overcome these defects, and after consultation we adopted the transverse planking with the rebate block."

This, taken in connection with the language of the Brocklebank & Trainor patent (*Record*, p. 179), is conclusive:

"A represents the bottom layer of the flooring, and BB and D the upper transverse portion thereof, consisting *of strips* arranged between the vertical blocks C, and secured to the part A, *by nailing* or otherwise." [Being the same use of nails which it is alleged was found necessary in the Nicolson.]

"According to one plan for preventing the block

C from working upwards, we arranged the dovetailed rebate *on one side* of the vertical block as represented at A, *the other side being straight and resting against the straight side of the strip B.* All the rows of blocks may be so rebated *on one side* and *secured* by *the strips* B, having *one vertical edge* and one bevelled to suit the rebates; or the said blocks may be rebated on both sides, and the strips fitted thereto. Two rows of blocks may be rebated on two sides, fronting each other, and a strip B' placed as represented, while the said rows *may be plain on their sides adjacent to the next rows each way, which are also plain, and every alternate space filled by a plain strip.*"

This would seem to show that it was intended to use the Nicolson patent, with the option of putting a nick on both or one side of the larger block, and making the strip to suit, and in either event to use the old Nicolson nails.

VII.

An effort is made to shield the City of Elizabeth, upon the ground that it did not participate in the reception of the profits which the Master has found.

This is an inconsequential inquiry. It is no answer to a suit for a wrong, whether the suit be one at law sounding in damages proper, or whether it be in equity, asking for the same amount of money under the name of profits or damages, to say that this money was not fairly divided. The argument of the appellants admits that the city would have been responsible in an action at law, and this admis-

sion is founded upon the fact that it was a joint tort-feasor. Its position as as a joint tort-feasor aggravates its defense in a Court of Equity, and renders it liable to account for the profits which have been made by the joint wrongs of all the defendants, irrespective of the division which may have been made between the wrong-doers themselves.

The argument of the appellants, however, studiously omits the fact first that those who gave the contracts under which the infringing pavement was laid received therefor $21,409.23, which, as Tubbs said, was "actually paid, part in cash and part in checks, for getting the contracts." This is nearly one-third of the $74,835.40, which the Master allowed as profits. If those who gave the contracts received that amount, and the city of Elizabeth gave the contracts, then the city of Elizabeth received that amount, and has had its arm in the joint profits to the extent of the $21,409.23.

The argument also admits, second, the fact that the city of Elizabeth exacted, and now retains, two bonds in the aggregate for $75,000, or some $200 more than the amount of profits reported by the Master, as its security, after it had been notified by the plaintiff that the Brocklebank & Trainor pavement would be an infringement of the Nicolson patent.

It refused to be warned by such notice, received the sum of $21,409.23 as a compensation for awarding the infringing contracts, and then took and now retains security for $75,000 to guard against its lia-

bility, which it then acknowledged by taking the security it had incurred by giving the contracts to which the security refers.

Under these circumstances, it would be a mockery of justice to say that the city of Elizabeth was an innocent party, having derived no benefit from the infringement in question.

VIII.

The object of this agreement as to Tubbs and the city of Elizabeth is to exculpate them, and to leave the plaintiff to its recovery against the New Jersey Wood Paving Company alone. How valuable that would be is to be seen from this extract from the records of the Company (Record, p. 268):

"Therefore, be it resolved by the Directors of the New Jersey Wood Paving Company, that they assume all the responsibility of George W. Tubbs in the said suit or suits, and that the entire assets, stocks, tools, fixtures and property belonging to the said company be assigned to said George W. Tubbs, to secure him against any cost or damage which may be recorded against him by the American Nicolson Pavement Company; provided, that in case said suits shall be decided against said American Nicolson Pavement Company, then such assignment to be null and void and of no force whatever; and in any case to be null and void when the said Tubbs shall be fully paid, satisfied and indemnified from any and all costs which he shall or may incur by reason of any liability on said bonds."

IX.

In York *vs.* Wyman (17 Howard, 39), this Court decided all that was necessary to sustain the decree in this case, by saying:

"If, then, the case had terminated with the facts that the infringement of the defendant's patent had taken place by the acts of persons using the corporate name of the plaintiff (in error), with the assent of the corporate authority, their liability would have been fixed."

Corporations are liable to the same extent, and under the same circumstances, as a natural person, for the consequences of its wrongful acts.

Abb. Dig. Corp., 880, § 46.

X.

Corporations are exempt from consequential damages only in one instance, and that is where, being clothed with the State right of eminent domain, it takes private property for public use, on making proper compensation, and where such damages are no part of the compensation required. For any injury outside of this they are liable as an individual.

Id., 875, §§ 6, 7, 8.